STATEMENT OF QUALIFICATIONS

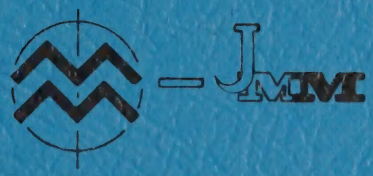
FOR

PROFESSIONAL ENGINEERING SERVICES

WATER IMPROVEMENTS PROGRAM

City of Helena, Montana

MAY 1, 1976



SUBMITTED BY

THE JOINT VENTURE OF

MORRISON MAIERLE, INC.

Consulting Engineers
Helena, Montana

JAMES M. MONTGOMERY

Consulting Engineers, Inc.
Pasadena - Boise

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MORRISON - MAIERLE - MONTGOMERY
A JOINT VENTURE
910 Helena Avenue, Helena, Montana 59601 (Tel: (406) 442-3050)

April 30, 1976

City of Helena
Public Service Department
City Hall Annex
38 South Last Chance Gulch
Helena, Montana 59601

Attention: Mr. C. R. Hanson, P.E., Director of Public Service
and Selection Committee for Water Capital Improvements
Program-Engineering

Re: 76-15
Water Improvements Program

Gentlemen:

Thank you for asking us to submit our qualifications for providing engineering services for your Water Improvements Program. Enclosed is a summary of the experience and personnel resources which we have available to carry out this project for the City of Helena.

Our proposal provides for the utilization of both the Helena based regional engineering firm of Morrison-Maierle, Inc., and the James M. Montgomery organization with worldwide experience specifically in waterworks design. The City of Helena has extended an invitation to both of our firms individually to submit qualifications for furnishing engineering services on the water project. Our two firms have been working jointly on two other water projects during the past year. Recognizing the size of the proposed Helena Program, we know our joint effort can best serve Helena's needs.

The Morrison-Maierle and James Montgomery firms have both gained their stature during the thirty years since World War II. This has been a period of major technological advancement in water treating methods and pipeline materials. The period has provided both consultants an excellent opportunity to compare the merits of newer equipment with the performance of older plants. Both firms have regularly been included in the Engineering News listing of the Top 500 design firms in the United States during the past ten years.

LEWIS & CLARK LIBRARY
120 S. Last Chance Mall
HELENA, MONTANA 59601

The James M. Montgomery firm is recognized throughout the engineering profession as one of the leaders in the study and planning of major waterworks projects. The staff available from the JMM firm includes experienced specialists in all fields of water supply, treatment, storage and pipeline work.

Morrison-Maierle has a 75 man organization with about 50 engineers and technicians located in Helena. Many of these are employed continuously in waterworks and wastewater engineering work. The utilization of the experienced M-M design firm and also the larger and more specialized JMM firm will assure the City of Helena of both the advantage of an in-town firm and the broader experience of a very large consulting engineering organization specializing only in waterworks design.

The information contained herein is provided as our Statement of Qualifications. We have avoided an excessively over documented presentation and endeavored to keep this statement to a size that your committee members can reasonably be expected to review in the initial phase of your selection process.

It is our understanding your committee will, following review of the indications of interest, select a limited number of Engineering firms to continue into the Interview Phase of your selection process. We anticipate the opportunity to provide a written "Proposal" for furnishing engineering services would be submitted at a later date if this further documentation is desired.

Your consideration of our firms is appreciated. We look forward to hearing from you.

Sincerely,

JAMES M. MONTGOMERY
CONSULTING ENGINEERS, INC.

John Somerville

John H. Somerville
Vice President & Boise Manager

MORRISON-MAIERLE, INC.
Consulting Engineers

Willis J. Wetstein

Willis J. Wetstein
Chief Environmental Engineer

Harold L. Eagle

Harold L. Eagle
Vice President

WJW:HLE/el

CITY'S INVITATION

COMMISSIONERS
A. W. SCRIBNER, MAYOR
EDWARD P. LORANZ
HARLEY WARNER
DON M. HARRIOTT
KATHLEEN RAMEY

RECEIVED
APR 21 1976
MORRISON-MAIERLE

PUBLIC SERVICE DIVISION
CITY HALL ANNEX
38 SOUTH LAST CHANCE GULCH
HELENA, MONTANA 59601
AREA CODE 406/442-9920
EXT. 30

Public Service
DEPARTMENT

City of Helena, Montana

April 16, 1976

Morrison-Maierle, Inc.
910 Helena Avenue
Helena, Montana 59601

Re: 76-15
Water Improvements Program

Gentlemen:

The City of Helena is pleased to announce that proposals will be received for Engineering Services for improvements in the City's water system as per the attached Scope of Services.

It is requested that those interested in submitting a proposal send resumes of their qualifications and supporting data to each member of the Selection Committee as noted on the attached list. We would like to have these submittals by May 1, 1976. The Committee will then review all submissions and determine what firms they wish to interview for the project. Those firms selected will be notified and an interviewer with each firm will be scheduled some time during the month of May.

We appreciate your interest in this project and hope you will be able to respond with a proposal.

Sincerely,

C. R. Hanson, P.E.
Director of Public Service

CRH/hw

MM – JM TEAM

PROGRAM

THE MORRISON-MAIERLE - MONTGOMERY JOINT VENTURE

This proposal provides for the two consulting engineering firms of Morrison-Maierle, Inc., of Helena and James M. Montgomery, Inc., with about ten offices throughout the Western United States, joining their forces to carry out the proposed Helena Water Improvements Program. These two firms are currently working together on water resource projects in the Yellowstone and Flathead Drainages.

With this two-firm arrangement, the City of Helena will receive the benefit of having a local firm provide over half of the desired services. Morrison-Maierle as the sponsoring firm in the Joint Venture will carry out coordination with the City, and will be available to meet with City, State and other Helena based officials as needed. Likewise, paper work (such as assisting with governmental forms and progress statements) will be handled locally where questions can be resolved on a first hand basis. A major portion of the design and plan preparation will be accomplished right in Helena by qualified engineers and technicians very familiar with the Helena and Ten Mile Areas. During construction, inspection can be efficiently handled without involving subsistence and out-of-town travel costs. In addition, Morrison-Maierle's officers and employees are citizens of Helena and know they will live with this project. Also, realizing the easiest job to live with is a well done one, they will provide the extra effort to achieve a quality project.

The James M. Montgomery Consulting Engineering firm specializes in planning and design of water supply, storage, distribution and filtration facilities. This organization includes about 280 engineers,

scientist and technicians. Their experience in the study and design of municipal water facilities is tremendous and is set forth in greater detail later in this statement of qualifications. The James M. Montgomery portion of the team assures the City of Helena of the expertise of a large firm with extensive experience in evaluating and designing large waterworks projects. The Montgomery portion of the Helena Water Improvement Program will be handled through their Boise, Idaho Office which is managed by John Somerville, a Vice President in the JMM firm and a registered Professional Engineer in Montana.

The James M. Montgomery firm was retained over one year ago by the Veterans Administration Center at Fort Harrison to prepare a study of their water system. In addition to water distribution and storage considerations, the study considered the present Ten Mile City supply and alternatives. In this project, the firm became well informed on the City's Ten Mile water system.

The Joint Venture arrangement between the Morrison-Maierle and James M. Montgomery firms contemplates the preliminary study work being accomplished about equally by each of the two firms. During the design phase of the project, Morrison-Maierle would provide more of the engineering services. Most construction inspection services would be supplied by the local firm.

The assistance of the James M. Montgomery staff in Operator Training and Plant Start-up can be secured. The City would be assured of two firms with impressive track records to be available through the future years for consultation on the facility. Morrison-Maierle's staff will be readily available to follow through on any needs even after completion of construction.

PROGRAM

PROPOSED WATER IMPROVEMENT PROGRAM

This brief discussion of the proposed improvements is included in this Statement of Qualifications to set forth the major components in the City of Helena's water system planned for improvement. Also, the tasks and steps in carrying out the desired engineering services are considered briefly to establish a basis for the types of engineering services required.

The Scope of Services for this project furnished by the City with the invitation to submit experience resumes states four major improvement areas which will be considered. These are as follows:

1. Ten Mile Supply and Transmission System
2. Ten Mile Water Treatment Facility
3. In-Town Water Storage
4. Integration of Systems and Controls

The First Phase of the Engineering Services will be the completion of a preliminary study. This will involve the review of previous studies and plans, field reconnaissance, gathering of other data to provide a complete basis for the project evaluations. Analysis of the existing water system giving consideration to total supply and storage in addition to the distribution system will be needed. The Ten Mile transmission system and in-town storage needs will be considered. The water quality of the Ten Mile system throughout the year will be evaluated in the Study Phase and suitable treatment alternatives studied. Needs to integrate the various water

system components including the Missouri and Ten Mile supplies, existing and proposed storage and involved pipe systems into a smoothly functioning unit with adequate central control and monitoring will be investigated. Completion of the Study Phase of the work should include illustrated verbal presentation of the findings to the City Commission and Officials. Finally, submission of an easily read report including sufficient drawings and illustrations will be needed. The report will present recommended improvements with priorities which can be used by the City to develop a Master Plan for the system to cover the projected future.

The Design Phase of the work will involve the expertise of many specialists. The engineering specialty areas involved will include hydrology, hydraulics, water treatment, chemical, computer analysis, structural design, electrical, mechanical, architectural, and environmental. The project will require a highly qualified team. In addition to the design specialists, experienced technicians and draftsmen will be required to formulate designs into detail plans for use in the bidding and construction stages of the work.

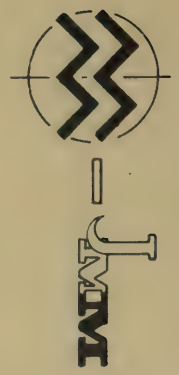
Following receipt of bids and awarding of construction contracts by the City, the Third Phase of the engineers' work will involve the Construction Inspection of the work. This is a most important phase and endeavors through careful inspection to assure the City that the improvements are completed in the field following the designer's intent as set forth in the Plans and Specifications. Preparation of regular inspection reports, monthly progress estimates of construction work completed and payments due, and documentation of any construction modifications au-

thorized are a few of the engineering services performed during the Construction Phase in addition to the day to day inspection.

On the following pages are three charts showing the general organizational structure proposed and the anticipated major tasks of work for the Study, Design and Construction Phases of the proposed engineering work. All of the charts are illustrative only at this stage. The Construction Inspection organization will be influenced considerably by scheduling of improvements, numbers of contractors and other factors that will not be known until the improvements program actually reaches the contract stage.

GENERAL ORGANIZATION & TASKS PROPOSED FOR HELENA WATER IMPROVEMENTS

"ENGINEERING - STUDY PHASE"



CITY OF HELENA
PUBLIC SERVICE DEPARTMENT

CONSULTANT'S
PROJECT ADMINISTRATION
MORRISON-MAIERLE, INC.

PROJECT MANAGER

CONSULTANT SPECIALISTS & TECHNICIANS

MORRISON-MAIERLE, INC. HELENA	JAMES M. MONTGOMERY

TASK 1
DATA RESEARCH-PREVIOUS REPORTS & PLANS - FIELD RECONNAISSANCE

TASK 2
EXISTING SYSTEM ANALYSIS - PROJECTED WATER NEEDS

TASK 3
TEN MILE SUPPLY LINE NEEDS-REPAIR AND/OR REPLACEMENTS

TASK 4
TEN MILE WATER TREATMENT FACILITY - WITH ALTERNATIVES

TASK 5
IN-TOWN STORAGE - SIZING & ALTERNATE LOCATIONS

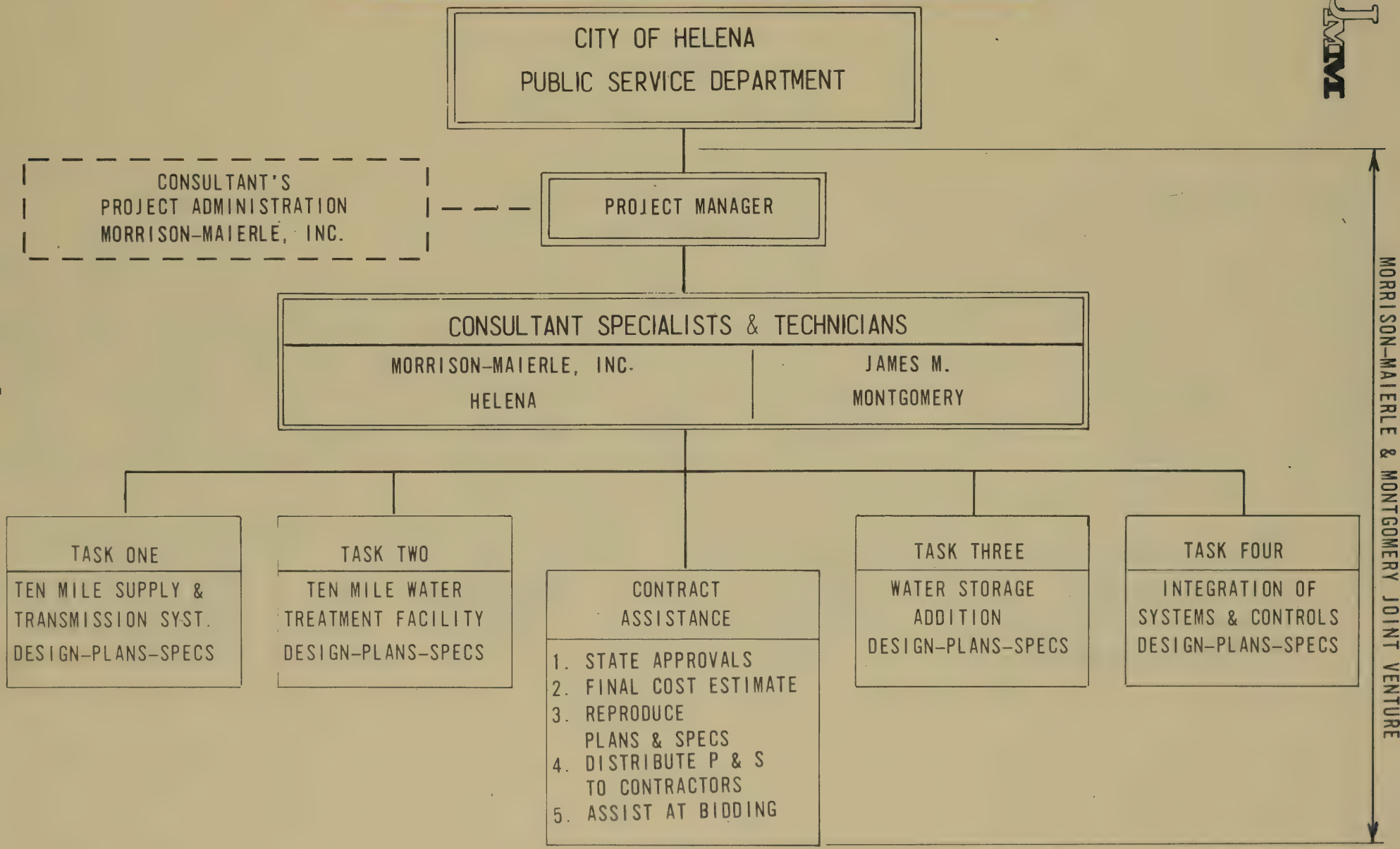
TASK 6
INTEGRATION OF NEW & EXISTING AUTOMATED CONTROL

TASK 7
REPORT - REVIEW - PRIORITIES, FINANCING & RECOMMENDATIONS

MORRISON-MAIERLE & MONTGOMERY JOINT VENTURE

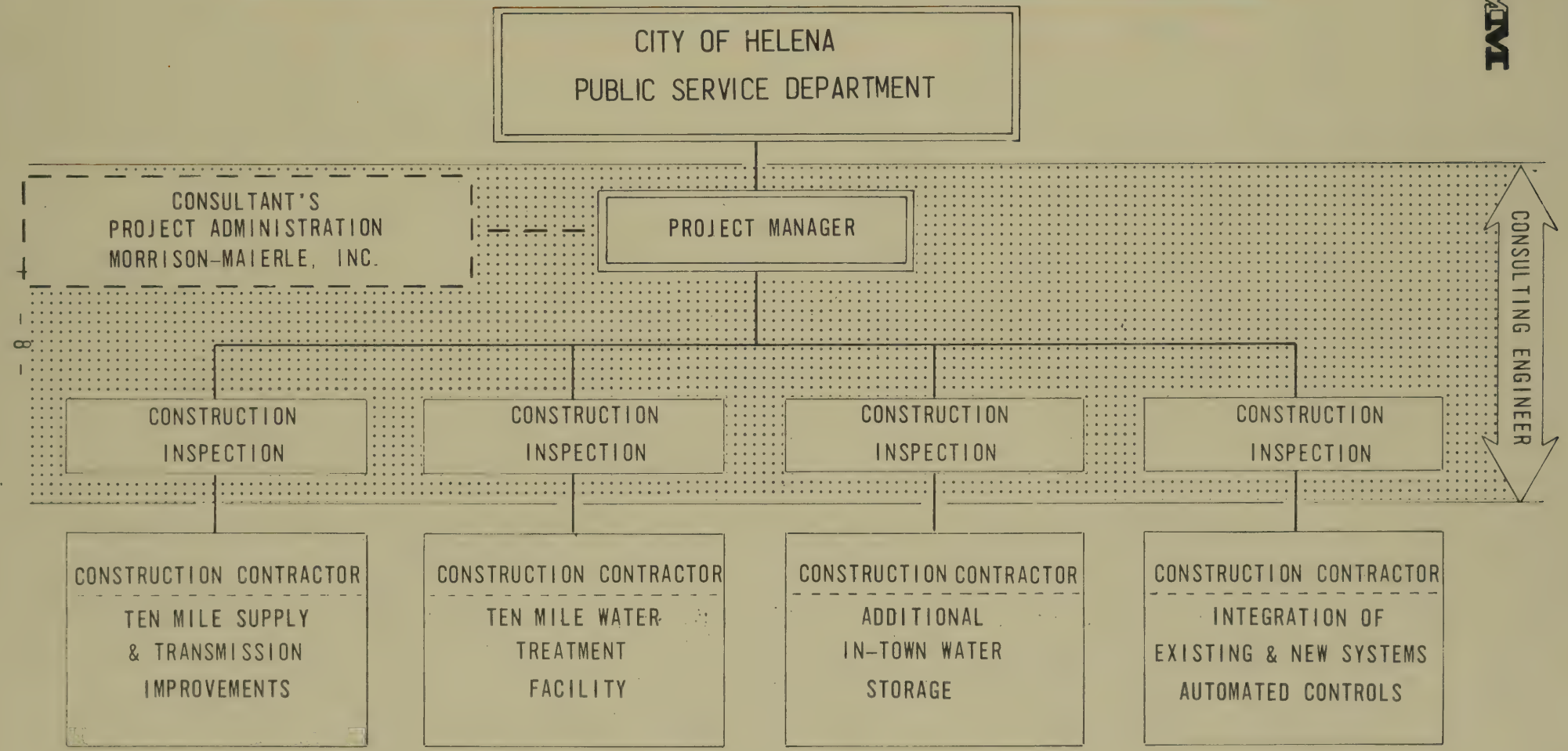
GENERAL ORGANIZATION & TASKS PROPOSED FOR HELENA WATER IMPROVEMENTS

" ENGINEERING - DESIGN PHASE "



GENERAL ORGANIZATION & TASKS PROPOSED FOR HELENA WATER IMPROVEMENTS

"ENGINEERING – CONSTRUCTION INSPECTION"



CAPABILITIES

EXPERIENCE

MAJOR CAPABILITIES FOR THE MORRISON-MAIERLE FIRM

As related to Municipal & Waterworks Projects

1. MASTER PLANS AND FEASIBILITY STUDIES

During Morrison-Maierle's thirty years of engineering service, 80 Municipal clients in Montana, Wyoming, Idaho and Utah have been provided service. In addition, 17 Federal and State governmental and industrial clients have retained Morrison-Maierle for work on water and wastewater projects. The firm has been retained by many of these clients for several projects. An estimated 150 significant studies and master plans for water and wastewater facilities have been prepared by Morrison-Maierle. A comprehensive study of water supply, storage and distribution system needs was completed for the City of Twin Falls, Idaho, a city of quite comparable size to Helena. The study was followed by an extensive improvements program including added supply, a large pump station, sizable transmission pipelines and storage. Similar water and wastewater plans have been developed for several of Montana's cities in the 10,000 to 20,000 population range.

2. WATER TRANSMISSION AND DISTRIBUTION SYSTEMS

Morrison-Maierle has for over ten years been utilizing computer analysis for reviewing and designing water distribution systems. The firm's remote terminals permit accomplishing this right from its office in Helena. Major water pipeline projects have been designed by M-M for Helena, Polson, Kalispell, Columbia Falls, Bozeman, Evergreen, Twin Falls, and others. Pipeline materials have included cast iron, ductile iron, asbestos-cement, concrete, steel, PVC and prestressed concrete. Dams and diversion structures have been designed for a number of the water supply pipeline projects.

3. WATER TREATMENT PLANTS

Water treatment plants for Gardiner, Ogden(Utah), Chester, Forsyth and Cut Bank were designed by Morrison-Maierle since 1968. These included one 4 MGD (Million Gallon per Day), two 5 MGD and one 22 MGD plant. The firm designed a complete water treatment plant for the City of Cut Bank in 1949. After 25 years of use the City again retained Morrison-Maierle to redesign and enlarge the treatment plant to increase the capacity from two to five million gallons per day. This was readily accomplished taking advantage of technological advances made during the 25 years. The new plant is under construction and nearing completion.

4. WATER STORAGE FACILITIES

The firm has designed 23 domestic water storage reservoirs. These have included prestressed concrete, cavity concrete, elevated steel and ground steel tanks. Sizes have varied up to five million gallons. Earthen reservoirs of much larger size have been designed by the firm both with and without liners for wastewater storage.

5. PUMPING STATIONS

A large number of water pumping stations have been designed by Morrison-Maierle and a very large number of wastewater pumping facilities. The Twin Falls water pumping station with a capacity of 25 Million Gallons Per Day is the largest of these designs.

6. AUTOMATIC CONTROL AND TELEMETERING

Morrison-Maierle has been involved with the automatic control of pumping equipment using reservoir fluctuations and pressure differentials to actuate changes in pumping rates. Telemetering has been used on most of these facilities and monitoring frequently accomplished from central locations. The control and monitoring equipment provided in the new Helena wastewater treatment facility addition designed by M-M is an example of the use of present day technology to achieve good control of a complex facility.

7. WATER RESOURCE EVALUATIONS

Morrison-Maierle's involvement in water resource studies and evaluations has grown to a major portion of the firm's activities in recent years. Projects include surveys and determinations of surface water and ground water resources together with evaluation of their potential use. Morrison-Maierle has conducted extensive water resource studies in Missouri, Colorado, Columbia and Hudson Bay drainages.

8. GROUND WATER

Numerous ground water studies have been conducted by Morrison-Maierle. These have included local studies for a determination of the feasibility of a water supply for a municipality and also large regional ground water studies for resource development for large irrigation projects. In-house geologists are available to select favorable drilling sites and to assist during the well drilling operations to assure the best and fullest development of available ground water.

9. OTHER

Morrison-Maierle has experience in many other aspects related to water and wastewater projects and is in a position to assist the client in completing these tasks. These other services may include water rate studies, project financing studies, government financing possibilities, taxation studies, preparing operation and maintenance manuals, operator training, preparing environmental impact statements or assessments, water rights studies and others.

MAJOR CAPACILITIES FOR THE JAMES M. MONTGOMERY FIRM

COMPANY BACKGROUND

James M. Montgomery, Consulting Engineers, Inc. was established in 1945. Corporate offices are located in Pasadena, with branch offices located in Irvine, La Jolla, Rancho California, Upland, and Walnut Creek, California; Fort Lauderdale, Florida; Boise, Idaho; Las Vegas, Nevada; and Reston, Virginia. The firm has overseas offices in Adelaide, South Australia; Caracas, Venezuela; Sao Paulo, Brazil; Manila, Philippines; and Jakarta, Indonesia. The staff consists of over 280 employees including 104 registered professional engineers. Sixty-seven have post graduate degrees in civil and sanitary engineering. Twelve members of the staff are diplomates of the American Academy of Environmental Engineers.

In the 31 years since it was established, the firm has acquired broad experience and expertise in the field of civil and sanitary engineering. To support its basic engineering capability, the firm has its own in-house services in the disciplines of mechanical, structural, electrical, environmental, architectural, geological and chemical engineering. Field support services include surveying and construction supervision. In addition the firm has its own State-certified water quality laboratory and General Automation 18/30 computer facilities.

Within the engineering disciplines, primary emphasis is placed on planning, design, preparation of plans and specifications and construction inspection. The following is a partial summary of water and wastewater projects which have been completed by the firm.

Major Pipeline Designs	Over 2,600 miles
Master Plans, Feasibility Studies, and Project Reports (water supply and wastewater)	175
Water Treatment Plant Designs	45
Pumping Station Designs	135
Reservoir Designs	150
Water Well Designs	150
Rate and Financial Analysis Studies	50
Environmental Impact Studies	25

In the past three decades, we have planned, designed and inspected construction of over $1.25 billion in water and wastewater projects for over 500 separate clients.

MAJOR CAPABILITIES FOR THE JAMES M. MONTGOMERY FIRM

1. MASTER PLANS AND FEASIBILITY STUDIES

Over 175 master plans and feasibility reports for water, wastewater, and industrial waste systems have been prepared by the firm. Many of the water system master plans and feasibility studies included detailed investigations of alternative sources of supply, management, financial, economic, and technical soundness analyses, as well as the preparation of preliminary plans, specifications, and cost estimates. In addition, JMM has prepared numerous other engineering studies, investigations, and reports on related subjects such as ground water development, special water and wastewater treatment problems, reservoirs, treatment plants, distribution systems, corrosion, water rates, appraisals, etc.

2. WATER TRANSMISSION AND DISTRIBUTION SYSTEMS

JMM has designed numerous major pipeline systems. These designs include more than 2,600 miles of pipelines in diameters up to 144 inches and installations under the most adverse conditions of surface congestion, underground utilities, rugged terrain, and unstable and corrosive soils. Designs have included open trench, tunnel, jacking, submarine, and other types of installations. For analysis of complex distribution systems JMM's own network program and in-house computer facility is used. Our staff has specialized knowledge and experience in corrosion and corrosion control, and actively participates in corrosion research and seminars.

3. WATER TREATMENT PLANTS

James M. Montgomery, Consulting Engineers, Inc. has a long history in the development of water treatment processes and techniques and is recognized nationally as a leader in the field. The staff has prepared studies and designs for over 45 water treatment plants, ranging in capacity from 1.0 MGD to 800 MGD. Our firm is associated with many recent advances in the field of water treatment. Innovations which have been incorporated in facilities that we have designed include pumped blenders (flash mixing), tapered hydraulic flocculation, designed compartmentalization, vacuum sludge removal, backwash conditioning, simplified filter controls, high rate filtration (10 gpm/sq.ft.), and air lift backwashing. These innovations have provided considerable reductions in construction and operating costs.

4. WATER STORAGE FACILITIES

Over 150 reservoirs have been designed by the firm ranging from a 20,000 gallon steel tank to a one billion gallon asphaltic lined open reservoir with a compacted earth embankment. Reservoir designs have included reinforced concrete, prestressed concrete, precast concrete arch-panel, and steel construction for buried, partially-buried, ground-level and elevated structures. The firm designed the recently constructed 64,400,000-gallon, 40-foot deep, reinforced concrete Dunsmuir Reservoir in Oakland, California. This storage facility is the largest

reservoir of its type in the United States and is also the deepest buried reservoir of large size in the country. James M. Montgomery, Consulting Engineers, Inc. was awarded an Engineering Excellence award in 1972 by the Consulting Engineers Council of the United States for the design of the 19.3 MG Greystone Reservoir for the City of Beverly Hills, California.

5. PUMPING STATIONS

Over 130 water and wastewater pumping stations have been designed ranging in capacity from 230 gpm to 250,000 gpm with total connected horsepowers up to 18,000 HP. These stations have included all types of pumps, both electric and natural gas drive units, electrical controls for both local and remote operations, and telemetering. Our experience includes the world's largest natural gas engine driven water pumping station located in Las Vegas, Nevada.

6. AUTOMATIC CONTROL AND TELEMETERING

With modern systems looking to automation for optimization and control, these principles are extensively used by JMM in designing the various components for water and wastewater systems. Extensive experience has been obtained in all fields of automatic control and data logging. Designs include radio and telephone-wire transmission systems and remote, unattended operation systems. These systems include all phases of water and wastewater system operation from starting and stopping a single pump to the unattended operation of complete water treatment plants. In most cases, the design of the system is preceded by a feasibility study setting forth the cost of the proposed system, the improvements to be expected in operation, and the savings to be realized in manpower.

7. PLANT START-UP AND OPERATION

Staff engineers have had extensive experience in the design, construction, and start-up of industrial process pilot and prototype installations. Industrial piloting has also included wastewater concentration and reclamation for reuse by reverse osmosis, electrodialysis, and ion exchange techniques. Biological wastewater treatment pilot work has involved both industrial and municipal waste systems, and has been used to obtain design data for plants now under construction. Certified wastewater treatment plant operators on the staff are qualified in plant start-up and operation, preparation of operation and maintenance manuals, and on-site investigations.

8. WATER RATE STUDIES

Over 50 analytical and statistical studies relating to water rates and cost of water have been completed. These studies have been prepared in support of recommended water rates as well as in opposition to suggested rate changes. Most supporting studies are based on detailed investigation

of water consumption patterns and their projections. Many of the water rate studies are prepared as an integral part of a complete financial analysis which considers bond issue financing, taxation on real property, reserve funding, disposal of excess utility property, other income sources, and ability to pay. The range of clients for whom water rate studies have been prepared included municipalities, water and irrigation districts, private water companies, governmental agencies, and individuals.

9. APPRAISALS

Over 40 appraisal reports involving primarily the value of water-utility properties have been prepared. The purpose of these reports has been to establish value for the buyer, the seller, or for both. In some instances, the objectives have been to evaluate system condition and depreciation requirements, as adjuncts to water rate investigations, eminent domain proceedings, and negotiated ownership transfers. Appraisals of various types of utilities have been prepared ranging from single water wells to large irrigation and domestic municipal systems. Appraisal techniques used include reproduction cost new less depreciation, original cost, substitutional methods, present-worth concepts, comparable sales, and capitalization.

10. BASIN MANAGEMENT AND HYDROGEOLOGY

Staff members have had extensive experience in the field of hydrogeological studies and ground water basin management. In all of the many master plans for water system development prepared by the JMM firm, a great amount of effort has been expended on comparing alternative sources of supply and evaluating the economic potential of these sources. Coordination of imported sources of supply with local surface and ground water supply has always been a major factor in these studies. JMM participated in an operational economic study of a large ground water basin in cooperation with a public agency. A mathematical model (digital) of the ground water basin has been developed by the agency. The model has been verified by geologic and hydrologic analyses, and alternative operational plans are presently being studied.

Numerous surface and subsurface studies for both local and regional water resource development programs have been conducted. Utilizing geologic, hydrologic, and geophysical data, the aquifer potential is evaluated and favorable drilling sites are selected. Supervision has been provided for all types of well drilling, development, and testing operations. Future water requirements have been determined by making detailed studies of projected land uses and water studies. Combining legal and institutional policies with water resource potential, basin operations have been developed which are consistent with sound ground water basin management. The firm has also participated in a number of water rights litigation cases, in which it has been necessary to recognize proper basin data and then, through the use of these data, correlate surface hydrology, ground water hydraulics, and water quality.

11. ENVIRONMENTAL IMPACT STUDIES

Specially trained personnel within the firm have prepared comprehensive environmental impact studies for numerous projects. Environmental studies have concentrated on water and wastewater projects plus associated areawide and facilities planning.

12. TRAINING PROGRAMS

In addition to on-the-job training programs associated with design, start-up, and operation and maintenance of water and wastewater treatment plants, JMM has provided specialized in-house observation and training programs for engineers sponsored by the Agency for International Development and by our international clients. Typical programs ranging from one month to a year include observation and practical training in water utility management and operation, long-range financial planning, water treatment design, water resources development, and ocean outfall design. Trainees involved in master planning and treatment plant design programs actively participate in actual project work.

NEL

EXPERIENCE

PERSONNEL QUALIFICATIONS

Morrison-Maierle, Inc., has about 75 engineers and technicians in their organization and the James M. Montgomery firm about 280. Included in these numbers are the following engineering and scientific employees.

	Morrison-Maierle	James M. Montgomery
Sanitary, Environmental and Water Resource Engineers	9	58
Hydrogeologists	2	4
Structural	5	6
Chemical	-	3
Electrical	-	6
Mechanical	-	4
Industrial	-	1
Civil (not included above)	11	33
Architects	-	2
Other Engineers & Scientists	1	4
Total Employees	75	280

The two firms can readily draw from their existing staffs to carry out the proposed engineering work. It is anticipated all study, design and other work would be accomplished in-house. The one exception to this would be that it is planned the Helena architectural firm of Crossman-Whitney-Griffin would be retained by the Joint Venture to assist in the aesthetic consideration of any major structures.

Biographical data including education and experience for the engineers who would likely be involved as a part of the study and design teams are contained on the following pages.

PERSONNEL QUALIFICATIONS - MORRISON-MAIERLE, INC.

WILLIS J. WETSTEIN

Specialty: Supervision of studies and designs of major waterworks and wastewater projects.

Willis Wetstein received his bachelor's degree in Civil Engineering from Montana State University. He is a registered professional engineer in Montana, Arizona and New Mexico. Mr. Wetstein is an active member of four national engineering societies. His nineteen years of engineering experience consisted first of the construction inspection of several projects including a very major addition to the Glendive water treatment plant; later his efforts were directed to the study and design of waterworks and wastewater projects, and the coordination of these projects with municipalities. For the past ten years, Mr. Wetstein has headed the Environmental Department for Morrison-Maierle, Inc. In this capacity he has been responsible for the planning, feasibility studies, design and construction inspection of numerous water and wastewater projects.

T. MICHAEL WATSON

Specialty: Water Resource Studies and Design

Mr. Watson received his bachelor's degree from the University of Denver and his Master's Degree from Montana State University in Civil Engineering. He is a registered professional engineer in Montana. His early engineering experience included field work and participation in feasibility studies for water resources projects. This included streamflow modeling work. Later in Mr. Watson's work, he conducted evaluation and stream and channel stabilization analysis. Mr. Watson supervised the design of an earthfill dam project for the Big Sky development. He has been responsible for numerous comprehensive water resource studies involving historial, present, and projected uses in Montana and New Mexico during the past several years. Mr. Watson's work in this regard involves major portions of the Milk, Clark Fork, and Poplar drainages and smaller portions of the Missouri and Flathead drainages in Montana. Also included are major portions of the Colorado and San Juan drainages in the Four Corners Area of the Southwest. Mr. Watson is the Chief Water Resources Engineer for Morrison-Maierle, Inc. He has testified before the United States Senate on some of these water resource studies. Currently, Mr. Watson is serving as a Technical Advisor to the United States Bureau of Indian Affairs in connection with hearings being held related to the use of International Waters by the United States and Canada.

TIMOTHY R. BERRY

Specialty: Environmental Engineering

Mr. Berry received both his bachelor's and master's degrees in Civil Engineering from Montana State University concentrating in the areas of sanitary engineering and hydraulics. He has carried out studies and designs for water distribution, supply, treatment and pumping facilities and also for wastewater collection and treatment projects. Mr. Berry is highly proficient in the use and preparation of electronic computer programs. He regularly utilizes computer analysis for water distribution systems. Mr. Berry has carried out computer modeling in connection with the study of surface waters and also ground water for sizable drainage areas. He is currently in charge of the design of wastewater treatment and industrial waste treatment improvements for Malmstrom Air Force Base. Mr. Berry's earlier experience included inspection and field layout experience.

CRAIG L. RILEY

Specialty: Design of waterworks and wastewater facilities

Craig Riley received a bachelor's degree in Civil Engineering and a master's degree in Environmental Engineering from Montana State University. He is registered as an Engineer-In-Training in Montana, and is a member of 5 engineering societies and fraternities. His experience includes preparation of feasibility studies, design of wastewater and water treatment plants. He has participated in the preparation of operation and maintenance manuals for water and wastewater plants. Graduate school experience included the operation of a pilot plant size wood chip slurry force main and pumping plant, as well as investigations into water hammer effects on the main, valves and pumps.

PHILLIP C. GREEN

Specialty: Structural Design

Phillip Green received his bachelor's degree in Civil Engineering from Montana State University and his master's degree in Engineering Mechanics from the University of Arizona. He is a registered professional engineer in Montana and Washington. His twelve years of engineering experience consisted first of construction supervision on several small special improvement districts involving street construction and as a structural engineer for the Boeing Company. For the past five years, Mr. Green has been a member of the Structural Engineering Department for Morrison-Maierle, Inc. In this capacity he has been responsible for the design of bridges, buildings, and special industrial structures, including design in steel, concrete, and timber. Mr. Green served as "acting" Department Head while the Chief Structural Engineer was involved with design projects in Vietnam.

RODGER C. FOSTER

Specialty: Water resource planning

Rodger Foster holds three degrees - a bachelor's in Construction Technology, a bachelor of science in Civil Engineering, and a Master's of Science also in Civil. He is a registered professional engineer in the State of Washington.

Mr. Foster has experience in water quality planning, facility regionalization studies, river basin water quality studies, sediment analysis, flood plain investigations, and regional wastewater collection and treatment facility planning.

Rodger was Project Manager for a 303 River Basin Water Quality Management Plan for a large river basin in the state of Washington in 1974. He gained considerable experience in environmental management through his work as Assistant Project Manager for a 3-year study of two large river basin studies in the Seattle vicinity.

Foster's experience in overall water quality management has proven valuable in his work on EPA 208 Planning Areas and implementing programs for water quality management.

C. WILLIAM KEITH

Specialty: Structural Design

William Keith received a bachelor's degree in Architectural Engineering and a bachelor's degree in Civil Engineering from Montana State University. He is a registered professional engineer in Montana and is an active member in two national engineering societies. His twenty years of engineering experience has encompassed building construction and inspection, structual design of various buildings, sewage and water plants, large precast storm drains for Billings, Montana and Salt Lake City, Utah. Water reservoirs of prestressed concrete, concrete and steel have been designed. Bridge design and inspections have been carried out in Montana, Idaho, Utah and Vietnam. For the past eleven years, Mr. Keith has headed the Structural Department of Morrison-Maierle with the exception of a 16 month period while serving as Assistant Project Manager and finally Project Manager for the Morrison-Maierle engineering team in Vietnam.

RICHARD S. HOLMGREN, JR.

Specialty: Supervision of studies and designs on major water and wastewater projects

Mr. Holmgren received his bachelor's degree in civil engineering at the Massachusetts Institute of Technology and his master's degree in sanitary engineering at the University of California. He is a diplomat in the American Academy of Environmental Engineers, a registered professional engineer in California, Alaska, Washington, and Jamaica, and an active member in various technical and scientific engineering organizations. Mr. Holmgren has over 22 years of experience in civil and sanitary engineering with particular emphasis on design development and planning management of environmental improvement programs. Experience includes preparation and supervision of feasibility studies, master plans, engineering reports, economic analyses, rate investigations, and establishment of design criteria for several major domestic and overseas water and wastewater system. He also has been responsible for design concepts, detailed design, supervision of engineering drawings, and inspection of construction on numerous water treatment plants, storage reservoirs, pumping stations, pipelines, wastewater, drainage, and flood control projects. His background also includes planning and implementation of U.S. Public Health Service sanitation programs.

JOHN E. SOMERVILLE

Specialty: Design of water and wastewater facilities.

Mr. Somerville received his Bachelor's degreee in Civil Engineering from Wisconsin State University and his Master's degree in Sanitary Engineering from Stanford University. He is a registered engineer in Montana, Wyoming, Idaho, Alaska, California, and Oregon. Mr. Somerville has over 14 years of experience in civil and sanitary engineering, with primary involvement in water supply and treatment, and municipal and industrial wastewater collection, treatment and disposal. As manager of the Boise office, he is responsible for the technical supervision and management of the projects in Idaho and other intermountain states. Mr. Somerville served as project engineer and has been responsible for the preparation of water and wastewater studies, environmental impact reports, and detailed plans and specifications for water treatment plants, water systems, wastewater collection systems, secondary and advanced treatment plants and disposal systems on overseas and domestic projects. He also has extensive experience in field surveys, construction inspection and management, operator training, federal grant and loan procurement, and public representation of projects. Mr. Somerville has held offices in and is a participating member in several technical and professional organizations.

SUSUMU KAWAMURA

Specialty: Design of water filtration and wastewater treating plants.

Mr. Kawamura received his bachelor's degree in civil engineering from Kobe Technical College in Japan. He received his master's degree and performed post-master graduate research at Ohio State University. He is a registered civil engineer in California, and a professional engineer in Japan. Mr. Kawamura has over 21 years of experience in civil and sanitary engineering with particular emphasis on the study and design of domestic and overseas water and wastewater treatment facilities. Design background includes development of conventional and automated water filtration plants, tertiary wastewater treatment plants, rehabilitation and expansion of existing water purification and softening facilities, design of storm sewers, booster pumping stations, water mains, and dam intake towers. Extensive research background is in the study and investigation of detergent degradation, sludge disposal, flocculation, sedimentation, filtration, and associated water-quality treatment processes. As a division engineer in the firm, Mr. Kawamura has been involved in the design of the Escondido-Vista Water Treatment Plant. He recently served as project engineer for rehabilitation and expansion of seven existing water treatment plants in Sao Paulo, Brazil. Mr. Kawamura is a member of several technical and professional organizations, and is the author of numerous civil and sanitary engineering publications.

NORBERT SCHNEIDER

Specialty: Design of industrial electrical and electrical control systems.

Mr. Schneider received his bachelor's degree in electrical engineering from the Polytechnic Institute at Salzburg, Austria. He is a registered electrical engineer in California, and a professional engineer in Florida and Austria. His more than 20 years of experience include planning, design, inspection, start-up, and overall engineering management of the electrical systems for water works projects and power generation facilities. Background is extensive in development of electrical power distribution, automatic control, instrumentation, lighting, and telemetry systems. He has been responsible for the design of electrical and instrumentation systems for numerous pumping stations, water and wastewater treatment plants, electrical generating stations, and data-transmission telemetry systems for the waterworks industry. As head of the firm's Electrical Engineering Division, Mr. Schneider is responsible for project management and coordination of various electrical engineers and support personnel assigned to this activity. In the field of industrial control, duties have included development of automatic start-up and power transfer of emergency generators, and the automatic and remote control of pumping stations. Work in telemetry has included feasibility and economic reports, concepts, and design of telemetry systems for numerous clients. Mr. Schneider has designed complete instrumentation systems for water and wastewater treatment plants. In addition he has provided consulting services to other consulting engineering firms in the specialized field of waterworks electrical control and telemetry.

BRIAN G. STONE

Specialty: Design of water and tertiary treatment plants.

Mr. Stone received his diploma in structural engineering from Perth Technical College, Australia, and his master's degree in civil engineering from the University of Southern California. He is a registered civil engineer in California, a chartered engineer in Australia, and a diplomate of the American Academy of Environmental Engineers. Mr. Stone has over 20 years of experience in civil engineering planning, design, and development of water and wastewater facilities with specialization in water and tertiary treatment plants. Experience includes preparation and supervision of feasibility studies, research investigations, master plans, cost estimates, specifications and reports, contract drawings and construction administration. He has been responsible for design and project management of several water treatment plants, storage reservoirs, pumping stations, ground water production facilities, pipelines, wastewater collection systems and tertiary treatment plants. As head of the firm's Water Department, he is responsible for coordinating the efforts of project engineers and support personnel assigned to water treatment, hydraulic structures, and general water projects. Mr. Stone is a member of several professional and technical organizations, and is currently a part-time faculty member of Loyola University of Los Angeles.

PHILIP GATSOULIS

Specialty: Structural design - Water reservoirs, treatment plants and conduits.

Mr. Gatsoulis received his master's degree in civil engineering from the University of Texas and his bachelor's degree in civil engineering from Robert College, Istanbul, Turkey. He is a registered structural engineer in California and Nevada and a registered civil engineer in California. His 18 years of experience include work in both civil and structural engineering with primary involvement in the investigation, study and design of water storage reservoirs, pipelines and treatment plants. He has also done structural design and planning of schools and commercial buildings, industrial plants, military installation facilities, recreational property developments, bridges and support structures. As head of the firm's Hydraulic Structures and Major Pipelines Division, Mr. Gatsoulis is responsible for program management and coordination of various project engineers and support personnel assigned to this activity. Typical experience includes the design of the 64.5 million gallon, buried, reinforced-concrete Dunsmuir Reservoir for the East Bay Municipal Utility District. Mr. Gatsoulis is a member of the American Society of Civil Engineers, the American Concrete Institute, and the Structural Engineers Association of Southern California.

DENNIS ECKHARDT

Specialty: Chemical Engineering

Mr. Eckhardt received his bachelor's degree in chemical engineering from the University of Utah and is a registered chemical engineer in California, with an application pending in Montana. He has over 8 years experience in chemical and civil engineering, specializing in domestic water supply and treatment, industrial waste management and pumping facilities. Mr. Eckhardt recently completed the design of a 10 million gallons per day Hardings water treatment plant and has participated in the design of several other water treatment plants up to 20 million gallons per day capacity. He also has been project engineer on a recent 12 million gallons per day pumping station. At Helena, Montana, he served as assistant project engineer on the engineering economic and feasibility study of the water supply system for the V.A. Center at Fort Harrison.

EXPERIENCE

EXPERIENCE SUMMARY FOR THE MORRISON-MAIERLE FIRM

Morrison-Maierle, Inc., has provided consulting civil engineering services to over 1,450 clients since the firm was started in 1945. Throughout this period municipal projects in water and sewer have been in the forefront. Morrison-Maierle, Inc. ranks among the top 15 percent of engineering firms in the U.S. in volume of design work. Its diverse range of services includes studies of feasibility, costs and benefits. The firm conducts design planning and implementation, maintains quality control of construction and construction materials, and provides operations management services for clients.

As qualified consultants, Morrison-Maierle, Inc. can evaluate every aspect of water works projects from inception to completion, recommending appropriate action based on the particular needs and circumstances of the clients.

On the following pages are summaries of projects involving water distribution and pipelines, reservoirs and water treatment plants.

REPRESENTATIVE LIST OF WATER DISTRIBUTION AND PIPELINE PROJECTS

DESIGNED BY MORRISON-MAIERLE, INC.

Client	Client
Circle, Montana	Busby, Montana
Columbia Falls, Montana	Birney, Montana
Glasgow, Montana	Lewistown, Montana
Dutton, Montana	Rapelje, Montana
Livingston, Montana	Cut Bank, Montana
East Helena, Montana	Billings Heights, Montana
Malmstrom AFB, Great Falls, Montana	Bridger, Montana
Opheim, Montana	Poplar, Montana
Kalispell, Montana	Lockwood Water Assoc., Montana
Bozeman, Montana	Whitefish, Montana
Havre, Montana	Huntley, Montana
Chinook, Montana	Twin Falls, Idaho
White Sulphur Springs, Montana	Warm Springs, Montana
Troy, Montana	Evergreen Water District, Kalispell, Montana
Manhattan, Montana	Seeley Lake, Montana
Glasgow AFB, Montana	Gardiner, Montana
Glendive, Montana	Frazer, Montana
Choteau, Montana	Ogden, Utah
Ronan, Montana	Big Sky, Montana
Helena, Montana	Eureka, Montana
Polson, Montana	Boulder, Montana
Ethete, Wyoming	Forsyth, Montana
Sidney, Montana	Billings, Montana

REPRESENTATIVE LIST OF WATER RESERVOIRS DESIGNED
BY MORRISON-MAIERLE, INC.

Client	Reservoir Capacity
Glasgow, Montana	-
Bozeman, Montana	2,000,000 gallons
Seeley Lake, Montana	100,000 gallons
Laurel, Montana	2,000,000 gallons
Gardiner, Montana	300,000 gallons
Frazer, Montana	75,000 gallons (Elevated)
Kalispell, Montana	100,000 gallons (Elevated)
Polson, Montana	500,000 gallons
Helena, Montana	500,000 gallons
Eureka, Montana	500,000 gallons
Boulder, Montana	100,000 gallons
White Sulphur Springs, Montana	300,000 gallons
Twin Falls, Idaho	5,000,000 gallons
Glendive, Montana	1,000,000 gallons
Billings Heights, Montana	2,000,000 gallons
Columbus, Montana	1,000,000 gallons
Forsyth, Montana	1,000,000 gallons
Sidney, Montana	1,000,000 gallons
Cut Bank, Montana	1,000,000 gallons
Basin, Montana	200,000 gallons
East Helena, Montana	500,000 gallons
Masonic Home, Helena	100,000 gallons (Elevated)
Evergreen Water District, Kalispell, Montana	1,000,000 gallons

LIST OF WATER TREATMENT PLANTS

DESIGNED BY MORRISON-MAIERLE, INC.

Client	Plant Capacity
Harlem, Montana	500,000 gallons per day
Glendive, Montana	5,000,000 gallons per day
Cut Bank, Montana	5,000,000 gallons per day
Gardiner, Montana	700,000 gallons per day
Ogden, Utah	22,000,000 gallons per day
Forsyth, Montana	3,800,000 gallons per day
Chester, Montana	1,250,000 gallons per day

TYPICAL WATERWORKS PROJECTS DESIGNED BY MORRISON-MAIERLE, INC.

PROJECT: WATER SUPPLY AND
WATER TREATMENT PLANT
OGDEN, UTAH

This project consisted initially of a Water Quality Study of the City's water supply and recommendations for expansion. The City's main sources of water were from an artesian well field and a treatment plant on the Ogden River.

The City's artesian well field was experiencing considerable problems with iron bacteria. It was determined that this was a result of corrosion of the artesian wells due to the submergence of the well field by Pineview Reservoir. To alleviate the problem, a new well field was designed and constructed outside of the reservoir area.

The study revealed improvements were also needed at the City's old 9,500,000 gallon per day (gpd) plant. In addition to expanding the capacity to about 22,500,000 gpd, modifications were made to improve plant operation, reliability, control and efficiency. Major plant additions and improvements included filter modifications to high rate units, chemical feeders, new plant electrical and control systems, piping, valves, pumps, etc. With future plant piping modifications, the plant will be capable of producing approximately 32,000,000 gpd as the filtering facilities were designed with this capability.

PROJECT: WATER SYSTEM IMPROVEMENTS
CUT BANK, MONTANA

This project consisted of Preliminary Studies, Final Design, preparation of Construction Drawings, and construction inspection for expanding the City's Water Treatment Plant, a new one million gallon storage reservoir and a new reservoir and distribution system supply line. The new reservoir provides a r apidly developing high-pressure zone in the City with adequate water supply for domestic needs and flows for fire protection. The reservoir will also provide additional storage for fire flows in the remaining portion of the City if the need arises. A new 18" supply line was constructed from the water plant to the City distribution system and and the existing One Million Gallon Reservoir to provide capacity needed for future water demands. Improvements to the City's water plant increased the capacity to Five Million Gallons Per Day (MGD) from the Two MGD capacity of the old plant which was constructed in 1950. In addition to plant capacity, other improvements were incorporated to improve plant operation, control and efficiency. Major improvements and additions included a new raw water well, river intake system, raw water pumps, high service pumps, flocculation and settling basin, chemical feeders, remodeling existing filters for high-rate capacities, new sludge collection facilities, sludge settling basins, new plant control and electrical systems, together with related plant structures, modifications, piping, pumps, landscaping, etc.

PROJECT: WATER TREATMENT PLANT
CHESTER, MONTANA

This project consisted of a new water treatment plant to improve water quality for the citizens of Chester. Previous to the construction of this plant, the community utilized untreated water from Tiber Reservoir which often was undesirable.

The new treatment plant has a capacity of 1.25 Million Gallons Per Day (MGD) which was sized to provide for expected growth for 20-25 years. Major plant components include flash mixing, flocculation basin, settling basin, high-rate filters, chemical feeders, high service and backwash pumps, sludge and backwash water settling basins, plant control and electrical systems for complete automatic control, piping, pumps, fencing, landscaping, etc. All plant components except for the sludge settling basins are housed within a structure containing less than 3000 square feet.

The plant contains the latest equipment specifically designed for small communities. Plant operation is automatically controlled by water demand of the community and does not require a full time operator in attendance.

Sludge wastes and backwash water are pumped to settling basins where the solids are allowed to settle. The liquid supernatant from these basins is recycled through the plant for retreatment; consequently, no liquid wates are discharged from the plant.

PROJECT: WATER SYSTEM IMPROVEMENTS
FORSYTH, MONTANA

This project consisted of the construction of a new one Million Gallon Reservoir, a new supply line between the reservoir and the City distribution system, and expanding the water treatment plant. Engineering services included final design, preparation of construction plans and specifications, and construction inspection.

The new 1 MG reservoir was constructed adjacent to the City's old 0.1 MG reservoir to provide additional storage volume for the City's domestic and fire flow needs. The new 16" supply line to the City's distribution system provides added capacity to transport the water to the community to satisfy these needs.

The City's old water plant which was constructed in the 1930's at a capacity of 1.5 Million Gallons per Day (MGD), was expanded to a capacity of 3.8 MGD under this project. Major plant additions and improvements included new flocculation equipment, settling basin, chemical feeders, remodeling existing filters for high-rate capacities, backwash waste settling basin, sludge drying beds, raw water pumps, high service pumps, new plant control and electrical systems, together with related plant structures, modifications, piping, pumps, landscaping, etc. Improvements were incorporated to improve plant operation, reliability, control and efficiency in addition to increasing the capacity.

Engineering to improve the environment.

Adequate water supply and efficient wastewater treatment and disposal are of prime importance to every community and every individual. The environmental engineer maintains or improves the quality of the water we use.

Morrison-Maierle's environmental engineering department is staffed and equipped to serve the needs of municipalities, government agencies and private industry, and has undertaken projects in this field for more than 150 clients. Capabilities of this department include:

Water supply systems— water treatment plants, pump stations, storage reservoirs, well supplies, dams, supply lines and distribution systems.

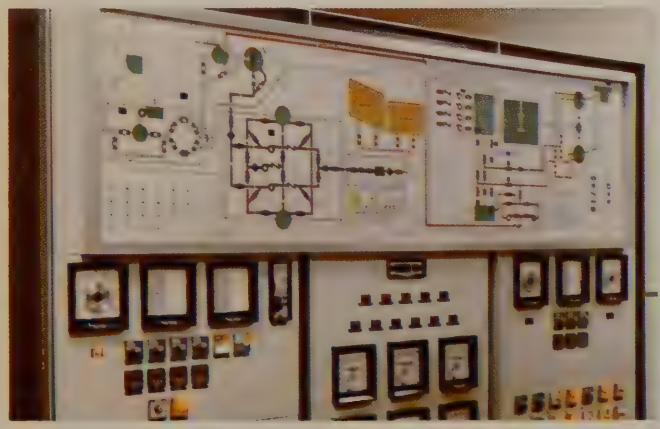
Sanitary sewer systems—wastewater treatment plants, pump stations and collection systems.

Storm drain systems—storm water collection, treatment and disposal facilities.

Services provided for the above projects include preliminary planning, preparation of construction plans and specifications, and construction inspection services.

Graphic Control Panel—Helena Wastewater Treatment Plant.

The graphic control panel gives the plant operator complete plant control and visual indication of all plant flows, equipment operations, valve positions and other plant functions from a single location in the Control Room.



Wastewater Treatment at Glacier National Park.

Morrison-Maierle designed wastewater collection and treatment facilities for the three major visitor areas in Glacier. The project prevents pollution by returning the treated wastes to the land; none reaches park waters.

Preserving the beauty of Big Sky.

Visitors to Big Sky admire these four attractive ponds, never knowing that the two most distant ones are for wastewater treatment. The process has no discharge, providing sanitary water for irrigation and other uses. Design of the facility is aesthetically in accord with Big Sky's architectural theme.

Making the most of our water resources.

Increased interest in wise management of water resources has resulted in substantially expanded activity for Morrison-Maierle's water resources section. Professional services in this field have become vital to production of energy, food, and fiber, as well as for the maintenance of the natural habitats of fish and wildlife, and human recreation needs.

Our water resources staff has diversified planning expertise in such specialized areas as irrigation, water rights, hydropower generation, domestic water supply, flood plain identification, mineral and industrial development, and fish, wildlife and outdoor recreation. The staff includes hydrologists, geologists, water resources planners, agricultural engineers and civil engineers specializing in hydraulics, statistics, computer applications, water quality and optimization.

The scope of study within projects has ranged from reconnaissance level planning, and feasibility studies, to actual design and construction. Within projects requiring selection of alternatives, our capability extends beyond fundamentals to watershed modeling, project simulation and operations research.

Morrison-Maierle has dealt with both small watersheds of local importance and nationally significant river basins, chiefly in the Northwestern and Southwestern U.S. Major studies have been conducted in the Missouri, Colorado, Columbia and Hudson Bay drainages.

Black Lake Dam.

Morrison-Maierle engineers studied the need for a dam to serve the Flathead Indian Reservation. Their solution not only provides the water, but also blends harmoniously with the surrounding area.

Million-gallon reservoir at Columbus.

Morrison-Maierle made feasibility studies for this water storage reservoir, and then designed the welded-steel structure. Holding water for both city and domestic use, the tank was set into the landscape for the least visual impact.

Emergency flood construction.

Part of the Montana Blackfeet Indian Irrigation Project, this pumping plant was designed to supplement river flow after flooding caused failure of the Lower Two Medicine Lake Dam, near Glacier National Park.

EXPERIENCE SUMMARY FOR THE JAMES M. MONTGOMERY FIRM

This summary is presented to illustrate the broad experience and expertise of James M. Montgomery, Consulting Engineers, Inc. in the planning, design, and construction inspection of water systems, and related engineering projects through brief project descriptions and representative lists of projects completed by the firm.

Within the Water and Wastewater Departments of the firm are divisions which contribute support services to all sanitary and civil engineering projects in the disciplines of architectural, chemical, electrical, environmental, geological, mechanical, and structural engineering. The company organization is structured to provide services necessary to efficiently execute projects ranging in scope from single purpose projects requiring minimal participation by our various disciplines; to comprehensive multipurpose projects requiring the inclusion of all the disciplinary capabilities and specialized knowledge and experience available among JMM's staff of highly-qualified engineers.

For almost three decades, James M. Montgomery, Consulting Engineers, Inc. has been a leading authority in the field of water treatment, and is recognized as a leader in the development of advanced processes and techniques in water treatment. Our staff has developed extensive expertise through the design of 45 major water treatment plants ranging in capacity from 3 mgd standard unit process plants to 800 mgd plants involving complex process and control facilities and extensive architectural design. James M. Montgomery received an award for Outstanding Achievement in Engineering Work from the California Society of the Professional Engineers for design of the 36-mile Devil Canyon-Azusa Pipeline for the San Gabriel Valley Municipal Water District.

Water Resources Division personnel have extensive experience in domestic and international projects which range in scope from locating small domestic water wells to development of water supplies for regional areas and major cities. Included among these projects are regional watershed evaluations, wastewater injection programs, artificial recharge planning and design, sanitary landfill siting, and environmental impact studies. These projects involve technical, planning, and managerial functions which include water resources location and development, evaluation of quantity and quality factors of water resources; formulation of resources management programs; water quality criteria studies; and expert witness presentations.

WATER SUPPLY, TREATMENT, AND DISTRIBUTION PROJECTS - JAMES M. MONTGOMERY

Contra Costa County Water District, Treated Water Division

Projects planned and designed for the District include water treatment plants, reservoirs, pumping stations, telemetering facilities and miscellaneous modifications and improvements to existing facilities.

Our firm has designed three water treatment facilities for the District including the Ralph D. Bollman Water Treatment Plant. The Bollman Plant incorporates the most modern design concepts for optimum water treatment at high filtration rates of up to 10 gallons per minute per square foot of filter media. The plant is designed for an initial capacity of 80 mgd and ultimate capacity of 250 mgd. Specific features of the plant include high-energy rapid mixing of chemicals; adjustable flocculators for high and low velocity gradient input; high rate dual media filters; air lift filter backwash; and turbidity measurement on each filter effluent. A unique feature of the plant which provides versatility and simplicity in operation is a fully automated central control panel. Additional facilities designed by the firm include nine reservoirs, ranging in capacity from 2 million to 10 million gallons, five pumping stations and telemetering facilities. Total construction costs for water supply facilities as recommended in a water master plan study prepared for the District were estimated to be $11,875,000.

City of Escondido and Vista Irrigation District

A joint use water treatment plant was planned and designed for the City of Escondido and Vista Irrigation District in order to maximize economic benefits to the two agencies through a combined facility. It is estimated that the plant will be in full operation by 1976 and it is designed to treat raw water from the State Water Project, the Colorado River, and local waters from Lake Henshaw, located in San Diego County. The treatment plant was designed with an initial capacity of 37.5 mgd and an ultimate capacity of 75 mgd. Treatment processes include chemical feed, rapid mixing, flocculation, sedimentation, dual-media filtration, and chlorination. Other project facilities include a pumping station and 5.4 million gallon clear water reservoir.

Helix Irrigation District

The R.M. Levy Filtration Plant was designed for the District to treat the water supply for a population of 290,000. The major raw water source to the plant is from the Colorado River. The plant was designed for an initial capacity of 50 mgd and an ultimate capacity of 80 mgd. We are presently engaged in the design of modifications to the original plant completed in 1964. The additional facilities will provide complete treatment including chemical feed, mixing, flocculation, sedimentation, rapid sand filtration, and chlorination. Appurtenant facilities include a pumping station and 5 million gallon filtered-water reservoir.

City of Inglewood

Numerous projects have been completed for the City including a hydraulic analysis of the water distribution system which serves a densely populated urban and commercial area of 4,776 acres. Water supply facilities which we have designed include the 15 million gallon Morningside Reservoir, pipelines ranging in diameter from 18 to 24 inches, two pumping stations, and telemetering facilities.

Jet Propulsion Laboratory

Our firm has designed several portions of the JPL water distribution system to include a looped-grid system and a 1 million gallon reservoir. Numerous other improvements and new facilities, including a 250 foot monolithic reinforced concrete bridge, have been designed. Additional projects involved design of modification for the Goldstone Power plant and a DC power generating plant in Pasadena consisting of two 3,300 hp DC generators driven by a 6,600 hp electric motor.

Las Vegas Valley Water District, Nevada

A master plan study was completed for the District which considered additional sources of water supply from Lake Mead. The study included an analysis of ground water quality and quantity, a complete layout of a distribution system and necessary treatment facilities required to provide a water supply from the lake. The District includes the cities of Las Vegas, North Las Vegas, and Henderson, Nevada. District population in 1960 was approximately 117,000 and the estimated population for the year 2020 was projected at 490,000.

Design projects for the District have included four reservoirs ranging in size from 10 to 40 million gallons capacity, five pumping stations, and two telemetering facilities. In addition, we have designed approximately 350,000 feet of pipeline for the District.

Metropolitan Water District of Southern California

We have either designed or provided conceptual design consulting services on all four of the MWD water treatment plants. These plants include the F.E. Weymouth Memorial Softening and Filtration Plant; Robert B. Diemer Filtration Plant; Joseph Jensen Filtration Plant; and Robert A. Skinner Filtration Plant.

The Weymouth plant is the largest ion exchange filtration plant in the world with an ultimate capacity of 600 mgd. The plant was designed under the direction of Mr. James M. Montgomery. Unit processes for treatment of raw Colorado River water include pre-chlorination, chemical feed, mixing, flocculation, sedimentation and rapid sand filtration. Following this treatment, a portion of the water passes through ion exchange softeners, and is then remixed with unsoftened water, chlorinated, and transported to a 50 million gallon finished water storage reservoir.

The Robert B. Diemer Filtration Plant was designed by our firm to treat water from the Colorado River and the California State Water Project. The plant was designed for an initial capacity of 300 mgd and an ultimate capacity of 600 mgd. Treatment processes include prechlorination, chemical feed, rapid mixing, flocculation, sedimentation, rapid sand and dual media filtration, and post-chlorination. Additional facilities designed include an 18 mgd filter wash water reclamation plant which returns the treated wash water for reuse in the main plant, and a 25 million gallon underground filtered water reservoir with parking facilities on the roof.

Our firm provided conceptual design consulting services for the Jensen and Skinner filtration plants which treat raw water from the California State Water Project. The Jensen Plant was designed for an initial capacity of 400 mgd and an ultimate capacity of 1,600 mgd and the Skinner Plant was designed for an initial capacity of 150 mgd and an ultimate capacity of 225 mgd. Unit processes for both plants include chemical feed, rapid mixing, flocculation, sedimentation, carbon adsorption, rapid dual media filtration and chlorination.

City of Newport Beach

We have planned and designed several major water supply projects for the City and also prepared a storm drain master plan covering a study area of 7,000 acres. The largest water supply facility designed consists of the 196 million gallon Big Canyon Reservoir. In addition to this major reservoir, design projects have included telemetering facilities and 21,000 feet of 18 to 30 inch transmission pipelines.

Rancho California Water District

Serving as District Engineer, we prepared a comprehensive water supply master plan for the 45,000 acre District area which considered ground water development, imported supply, transmission and distribution pipelines, storage reservoirs, and pumping stations. The report included a complete financial analysis and was the basis for a successful $55,000,000 general obligation bond issue to finance the construction of the recommended facilities.

Facilities designed for the District include seven reservoirs with capacities up to 2.2 million gallons, 17 wells, 200,000 feet of 4- to 24-inch pipeline, and several pumping stations.

Reedy Creek Improvement District (Disney World, Florida)

Bay Lake is the largest body of water in the chain of lakes, lagoons, and waterways in Disney World, Florida. Because of the unique characteristics of the Disney project and its dependence, to a large extent, on water-oriented activity, these surface waters have to be of maximum quality, both from a purity and an aesthetic viewpoint. Originally Bay Lake was a natural body of water infested with algae and other aquatic vegetation. The Lake was drained completely, some of its bottom silt was removed, and its shores were rebuilt. The refilled lake was chemically treated to remove its turbidity in an operation without precedent on this scale, which yielded high quality, clear water. A maintenance program has been established to keep the water free from algae bloom which included fish stocking, chemical treatment, and other environmental protective modifications of the surrounding area.

San Gabriel Valley Municipal Water District

Our firm is providing engineering services including design, surveying and construction supervision and inspection for the District's Devil Canyon-Azusa Pipeline. The pipeline will transport State Water Project flows from the Devil Canyon Power Plant Afterbay to the San Gabriel River for spreading and percolation in the San Gabriel Basin. The water will be recovered by pumping to serve the cities of Azusa, Sierra Madre, Alhambra and Monterey Park.

The project involves approximately 36 miles of pipeline ranging in size from 30 to 54 inches, with appurtenant structures including pressure reduction stations and turnouts. The first 5 miles of the pipeline included an alternate design to allow participation by the San Bernardino Valley Municipal Water District if desired. Design of the project facilities has been completed and construction will be initiated in early 1973.

City of Sao Paulo, Brazil

Our firm designed the Guarau Water Treatment Plant for the Companhia Metropolitana de Agua de Sao Paulo, Brazil (COMASP) as part of the Juqueri System which serves approximately 6,000,000 people. Initial capacity of this plant is 500 mgd; ultimate capacity is 750 mgd. Related design projects included telemetering facilities and approximately 300,000 feet of 24 to 84-inch pipeline for water transmission and distribution.

City of San Diego

The entire City of San Diego is served by the Alvarado and Miramar Water Treatment Plants designed by our firm. The Alvarado Plant has an initial capacity of 100 mgd with an ultimate capacity of 150 mgd. The Miramar Plant has an initial capacity of 75 mgd with an ultimate capacity of 150 mgd. Both plants were designed to treat Colorado River water delivered by gravity from the San Diego Aqueduct and supplemental local water pumped to the plants. Treatment processes include prechlorination, chemical feed (including activated carbon), mixing, flocculation, sedimentation, rapid sand filtration, and post-chlorination. Sensing controls on plant influent and effluent flow meters were designed to provide automatic adjustment of chemical feed rates to match flow rates through the plant. Design of water facilities for the City also included the 15 million gallon South San Diego Reservoir, pumping stations, and telemetering facilities.

San Dieguito Irrigation District

Our firm recently prepared a comprehensive master plan for a water supply system for the District capable of serving a population of 55,000 by the year 2000 with an ultimate estimated population of 75,000. Facilities designed for the District included a 13 million gallon reservoir and a pumping station. Numerous transmission and distribution pipelines of up to 54-inch diameter were designed in addition to a water treatment plant with an initial capacity of 18 mgd and an ultimate capacity of 27 mgd. The reservoir and transmission main projects were executed for a joint usage agreement between the District and the Santa Fe Irrigation District.

City of San Francisco

Several projects related to water supply and treatment have been designed for the City of San Francisco. Major projects include the 11 million gallon Stanford Heights Reservoir, and the San Andreas and the Sunol Valley water treatment plants. Both the San Andreas and Sunol Valley plants were designed for initial capacities of 80 mgd and ultimate capacities of 160 mgd. Treatment processes at the San Andreas Water Treatment Plant include chemical feed, rapid mixing, flocculation, sedimentation, filtration, and chlorination. Facilities include a pumping station, clear water storage reservoir, wash water storage tank, and a drain pipeline to the San Andreas Reservoir.

The Sunol Valley Water Treatment Plant has the same unit treatment processes as the San Andreas Plant with modified design features including horizontal flow flocculation and settling basins with travelling bridge sludge removal equipment; dual media filters; fluoridation feeders; and a chemical and bacteriological laboratory. Our firm was also responsible for enlargement of the Sunol Filtration Plant and balancing the Crystal Springs Reservoir for its associated by-pass tunnel and pumping station. Additional projects have involved design of pumping and booster stations and various telemetering facilities.

City of Sacramento

Montgomery provided complete engineering services for the City of Sacramento's American River and Riverside water treatment plants. Projects have involved the design of three reservoirs, pumping stations and telemetering facilities in addition to the treatment facilities.

The American River Filtration Plant has an initial capacity of 72 mgd and ultimate capacity of 404 mgd. Treatment unit processes include chlorination, chemical feed, rapid mixing, flocculation, sedimentation and rapid sand filtration. The plant filters are completely automatic and are designed for control by loss of head or time cycle. In addition to the main treatment plant, the project included the design of a large river intake structure and pumping station, grit basin and a 20 million gallon buried concrete filtered water reservoir.

The Riverside Water Treatment Plant was designed to treat a 14 mgd water supply from local wells with a high iron and manganese content. Treatment unit processes include grit removal, aeration, lime and chlorine feed, contact basins, and rapid sand filtration. The plant was designed to be operated unattended through automatic controls from central telemetering facilities at the American River Filtration Plant.

REPRESENTATIVE LIST OF WATER TREATMENT PLANTS

Client	*Initial (mgd)	*Ultimate (mgd)
Alameda County Water District	25.5	25.5
Azusa Valley Water Company	7.5	40
Basic Management, Inc.	20	20
Basic Management, Inc.	4	4
Contra Costa County Water District - Bollman Plant	80	250
Contra Costa County Water District - Chenery Plant	16	24
Contra Costa County Water District - Ygnacio Plant	.7	10
Covina Irrigating Company	15	15
El Centro - Modernize Plant	6	6
Escondido - Vista	37.5	75
Fairfield - Waterman Treatment Plant	15	45
Falmouth Jamaica - Martha Brae River Plant	1.2	1.2
Florida Keys Aqueduct Authority (Reverse Osmosis)	1	1
Helix Irrigation District - R.M. Levy Filtration Plant	50	80
Hopewell, Jamaica - Great River Plant	1.2	1.2
International Paper Company	2.5	3.5
Jamaica, Government of - Roaring River Plant	12	12
Kaiser Steel - Fontana	8	8
Lauderhill, Florida, City of	8	16
Long Beach - Frank Wall Plant	25	45
Long Beach - Addition	25	45
Metropolitan Water District of Southern California** La Verne Plant, 1st Phase	150	600
Metropolitan Water District of Southern California** Joseph Jensen Plant, 1st Phase	400	600
Metropolitan Water District of Southern California Diemer Plant, 1st Phase	300	600
Metropolitan Water District of Southern California** Robert A. Skinner Filtration Plant	150	225
Monrovia	2	2
North Lauderdale, Florida, City of	2.5	7.5
Ontario	7	14
Opa Locka, Florida, City of	2.3	5.2
Pasadena	7.5	7.5
Pomona - Pedley Plant	5	5
Reedy Creek Improvement District (Disney World)	15	15
Sacramento - Riverside Plant	16	16
Sacramento - American River Plant	72	404
San Clemente	3	3
San Diego - Alvarado Plant	100	150
San Diego - Miramar Plant	75	150
San Dieguito - Santa Fe Irrigation District	27	40
San Francisco - Sunol Valley Plant***	80	160

REPRESENTATIVE LIST OF WATER TREATMENT PLANTS
(Continued)

Client	*Initial (mgd)	*Ultimate (mgd)
San Francisco - San Andreas Plant***	80	160
Sao Paulo, Brazil - Guarau Plant***	500	750
Sao Paulo, Brazil - Alto Da Boa Vista	365	365
Sao Paulo, Brazil - ABC	61	61
Sao Paulo, Brazil - Casa Grande	61.5	61.5
Santa Barbara - William B. Cater Plant	15	40
Santa Monica	7.5	7.5
South Australian Govt. - Anstey-Hill Plant (Adelaide)	83	166
Stockton East Water District	30	60
U.S. Energy and Research Administration	1.5	1.5

* Maximum hydraulic capacity
** Consulting services only
*** In association with another consultant

REPRESENTATIVE LIST OF WATER STORAGE RESERVOIRS

Client	Name of Reservoir	Capacity (gallons)
Anaheim, California, City of		4,000,000
Arcadia, California, City of	Orange Grove Reservoir	3,500,000
	Santa Anita Reservoir	4,100,000
ASD Corporation		600,000
Azusa, California, City of		600,000
Basic Management, Inc., Nevada		1,500,000
Bellflower, California, City of		2,000,000
Beverly Hills, California, City of	Reservoir 4B	1,000,000
	Reservoir 5	1,000,000
	Reservoir 6	1,000,000
	Reservoir 7	1,200,000
	Greystone Reservoir	19,330,000
	Lower La Cienega	200,000
	Sunset Reservoir	6,000,000
Buena Park, California, City of		20,000,000
Chino Basin Municipal Water District	Feeder Reservoir	3,000,000
	Fontana Reservoir	3,000,000
Contra Costa County Water District	Bailey Reservoir No. 1	2,000,000
	Bailey Reservoir No. 2	4,500,000
	Bollman Filtration Plant Reservoir	10,000,000
	Country Club Reservoir No. 1	3,000,000
	Divide Tanks (two)	250,000 each
	Elderwood Tank	1,700,000
	Lime Ridge Reservoir	3,000,000
	Newhall Reservoir	3,000,000
	Nob Hill Tank	500,000
	Pine Hollow Reservoir (two)	2,000,000 each
	San Miguel Reservoir (two)	2,000,000 each
	Seminary Tank	500,000
Covina, California, City of		3,000,000
Crescenta Valley County Water District	Gross Reservoir	500,000
	Oakland Reservoir	1,500,000
	Smith Reservoir	500,000
Cucamonga County Water District	Banyon Avenue Reservoir	1,000,000
Duarte Water Company	New Scott Reservoir	1,500,000
East Bay Municipal Utility District	Dunsmuir Reservoir	64,400,000
Foothill Municipal Water District	La Canada Reservoir	1,000,000
	Paschall Reservoir	1,000,000
Fountain Valley, California, City of	Euclid Street Reservoir	5,000,000
Fullerton, California, City of	Reservoir 2D-1	6,500,000
	Reservoir 2D-2	6,500,000
	Reservoir 2D-3	6,500,000
	Reservoir 2D-4	6,500,000
	Reservoir 2D-5	6,500,000
	Reservoir 3BC	5,000,000
	Acacia Reservoir No. 2	5,000,000
	Acacia Reservoir	5,000,000

REPRESENTATIVE LIST OF WATER STORAGE RESERVOIRS
(Continued)

Client	Name of Reservoir	Capacity (gallons)
Fullerton, California, City of		
	Laguna Reservoir	2,000,000
Inglewood, California, City of	Morningside Reservoir	15,000,000
International Paper Company		1,250,000
Irvine Ranch Water District	San Joaquin Reservoir	990,000,000
Las Vegas Valley Water District	Campbell Reservoir	40,000,000
	Charleston Heights No. 1	30,000,000
	Charleston Heights No. 2 (2 tanks)	10,000,000 each
	Fayle Reservoir	40,000,000
	Pico Reservoir	20,000,000
	Smoke Ranch	20,000,000
	Southwest Reservoir	3,200,000
	West Central Reservoir	20,000,000
Long Beach, California, City of		14,000,000
Metropolitan Water District of Southern California		25,000,000
Monrovia, California, City of	Cloverleaf Reservoir	6,500,000
	Emerson Flats Reservoir	500,000
	Ivy Avenue Reservoir	3,200,000
	Mountain Avenue Reservoir	5,000,000
	Norembega Reservoir	1,000,000
Monterey Park, California, City of		3,000,000
Newport Beach, California, City of	Big Canyon Reservoir	196,000,000
North Lauderdale, Florida, City of		2,000,000
North Marin County Water District	Pacheco Reservoir	5,000,000
Oceanside, California, City of	El Camino Reservoir	3,000,000
Ontario, California, City of	Boles Reservoir	2,000,000
	Fern Avenue Reservoir	20,000,000
	Totman Reservoir	5,570,000
Opa Locka, Florida, City of		800,000
Pasadena, California, City of	Coronet Reservoir	1,400,000
	Hastings Reservoir No. 2	1,400,000
	Jones Reservoir	50,000,000
Pomona, California, City of	Reservoir 2B	2,000,000
	Reservoir 2C	3,000,000
	Reservoir 4B	1,000,000
	Reservoir 5B	10,000,000
	Reservoir 7B	3,000,000
	Reservoir 8A	3,000,000
	Reservoir 8B	3,000,000
	Reservoir 9	5,400,000
Rancho California Water District	Reservoir No. 1	2,200,000
	Alvarez Reservoir	1,000,000
	Anza Reservoir	2,200,000
	Buck Mesa Reservoir	1,600,000
	DePortola Reservoir	2,200,000
	General Kearny Reservoir	2,200,000
	Palomar Reservoir	3,000,000

REPRESENTATIVE LIST OF WATER STORAGE RESERVOIRS
(Continued)

Client	Name of Reservoir	Capacity (gallons)
Redlands, California, City of	Country Club Reservoir	2,000,000
	Dearborn Reservoir	7,500,000
Reedy Creek Improvement District	Pumping Station "A" Reservoir	3,000,000
Sacramento, California, City of	Contact Basin	1,000,000
	Florin Reservoir	15,000,000
	Riverside Treatment Plant Clearwell	3,000,000
San Bernardino, California, City of	Perris Hill Reservoir	10,000,000
San Diego, California, City of	South San Diego Reservoir	15,000,000
San Dieguito Irrigation District	Santa Fe Irrigation Dist. Joint Reservoir	13,000,000
San Francisco, California, City of	Crystal Springs Reservoir	60,000,000
	Stanford Heights Reservoir	11,000,000
Santa Ana, California, City of	Cambridge Reservoir	1,200,000
	East Reservoir	6,000,000
	South Reservoirs (two)	6,000,000 each
	Walnut Street Reservoir	7,000,000
	West Reservoir	6,000,000
Santa Barbara, California, City of		5,000,000
Santa Monica, California, City of	Riviera Reservoir	25,000,000
Santa Rosa Ranches Water District	Carancho Reservoir	1,500,000
Sierra Madre, California, City of	Auburn Reservoir	1,300,000
	Mira Monta Reservoir	1,000,000
Sunny Slope Water Company	Reservoir No. 4	6,000,000
Torrance, California, City of		10,000,000
Umark, Inc.-West Covina	Zone I Steel Reservoir	7,000,000
Upland, California, City of	15th Street Reservoir	4,000,000
	19th Street Reservoir	5,400,000
Ventura, California, City of	Foothill Reservoir	750,000
	Golf Course Reservoir	200,000
	Sexton Reservoir	2,600,000
	Willis Reservoir	1,000,000
Vernon, California, City of	Civic Center Reservoir	10,000,000
Vista Irrigation District	HP Reservoir	5,000,000
	HB Reservoir	5,000,000
Yorba Linda County Water District	Two Reservoirs	3,000,000 each
	East Side Reservoir	7,000,000

REPRESENTATIVE LIST OF PUMPING STATIONS

Client	Type	Pumps No. (fut.)	Design hp	Design gpm
Anaheim - West Ridge Pumping Station	Horiz	2(1)	185	1,850
Avalon - Sewage	Vert	2	40	3,600
Avalon - Sea Water	V.T.	2	200	3,600
Azusa - Reservoir No. 1 P.S.	Horiz	2(1)	300	2,700
Bellflower - Flora Vista	V.T.	3	310	5,100
Beverly Hills - No. 2	Sub	3(2)	875	11,000
Beverly Hills - No. 3	Sub	2(1)	375	5,700
Beverly Hills - No. 4A	V.T.	1	20	2,000
Beverly Hills - No. 4B	Sub	2	250	3,000
Beverly Hills - No. 5	Sub	2	150	1,900
Beverly Hills - No. 6	Sub	2	150	2,000
Beverly Hills - No. 8	Horiz	4	280	2,850
Beverly Hills - La Cienega	V.T.	4(1)	1,000	12,000
Beverly Hills - Lower La Cienega	Sub	3(1)	240	6,000
Chino Basin MWD - No. 1	Vert	2	200	3,000
Coachella Valley CWD - Hayes St. Reservoir P.S.	Sub	3	300	2,250
Contra Costa CWD - San Miguel (Zone 2)	Sub	5(1)	675	15,200
Contra Costa CWD - San Miguel (Zone 3)	Sub	2(1)	125	1,320
Contra Costa CWD - Nob Hill	V.T.	2	200	4,000
Contra Costa CWD - Pine Hollow	Horiz	3(3)	375	6,000
Contra Costa CWD - Seminary	V.T.	2	300	4,400
Contra Costa CWD - Bailey	Horiz	3(3)	375	7,500
Contra Costa CWD - Clayton Valley	V.T.	3(2)	300	5,025
Contra Costa CWD - Ygnacio Raw-Water	V.T.	2(2)	80	1,900
Contra Costa CWD - Paso Nogal	V.T.	2	80	1,900
Contra Costa CWD - Elderwood	V.T.	2	80	1,900
Contra Costa CWD - Mallard P.S. Equip.	V.T.	2	500	11,200
Contra Costa CWD - Government Ranch	V.T.	3	600	7,500
Contra Costa CWD - Bollman P.S.	V.T.	4	2,800	56,000
Covina - Charter Oak	V.T.	2(2)	300	5,200
Crescenta Valley CWD - Paschall	Sub	2(1)	500	4,000
Cucamonga CWD - No. 1 through No. 5	Sub	10	1,475	14,100
Duarte Water Company - New Scott	V.T.	2(2)	200	1,700
El Centro	Horiz	2	115	6,200
Fairfield - Suisun	V.T.	3(1)	900	15,200
Foothill MWD - La Canada	Sub	3(1)	800	5,600
Foothill MWD - Main	Sub	6(4)	5,000	30,000
Fountain Valley - Euclid Street	V.T.	2(1)	225	6,000
Fullerton - Laguna	Sub	1(2)	120	2,400
Fullerton - 3 BC-4	Horiz	2	50	1,200
Goleta Sanitary District - Sewage	V.T.	2	120	6,000
Inglewood - Morningside	——	—	635	10,000
Inglewood - North	V.T.	3(1)	400	14,400
Jamaica, Government of - Beacon	V.T.	2	45	340
Jamaica, Government of - Palmetto Pen	Horiz	2	50	940

REPRESENTATIVE LIST OF PUMPING STATIONS
(Continued)

Client	Type	Pumps No. (fut.)	Design hp	Design gpm
Jamaica, Government of - Ewarton	V.T.	2	60	840
Jamaica, Government of - Miranda Hill	V.T.	1	60	1,900
Jamaica, Government of - Salt Springs	V.T.	2	65	320
Jamaica, Government of - Reading Springs	V.T.	1	75	230
Jamaica, Government of - Spanish Town	V.T.	3	75	2,500
Jamaica, Government of - Appleton Hall	V.T.	2	100	1,100
Jamaica, Government of - Hounslow	V.T.	2	110	840
Jamaica, Government of - Nutshell	Horiz	3	120	1,100
Jamaica, Government of - Barnstaple	V.T.	6	120	1,460
Jamaica, Government of - Tollgate	Horiz	3	180	2,300
Jamaica, Government of - Jericho	Horiz	3	240	1,920
Jamaica, Government of - New Forest	V.T.	4	260	1,000
Jamaica, Government of - Falmouth	V.T.	5(4)	275	7,100
Jamaica, Government of - Hopewell-Sandy Bay	V.T.	7(4)	480	11,600
Las Vegas VWD - Whitney	Sub	4(2)	2,100	15,000
Las Vegas VWD - BMI Intake	V.T.	5	4,000	30,000
Las Vegas VWD - BMI No. 2	Sub	5(1)	2,400	30,000
Las Vegas VWD - Bonanza	V.T.	3(1)	525	8,000
Las Vegas VWD - Charleston Boulevard	V.T.	4(7)	1,250	17,200
Las Vegas VWD - Manganese	V.T.	3	300	4,050
Las Vegas VWD - Charleston Heights	V.T.	2(8)	1,250	16,000
Las Vegas VWD - Charleston Heights Addition	V.T.	4	500	6,400
Las Vegas VWD - Pittman	—	—	—	—
Las Vegas VWD - Campbell Reservoir P.S.*	V.T.	11(2)	7,500	84,000
Las Vegas VWD - West Central P.S. (Zone A)	V.T.	3(5)	560	13,500
Las Vegas VWD - Fayle Reservoir P.S.	V.T.	5(7)	3,600	49,000
Laguna Beach - No. 1 through 11	Vert	Various	180	4,500
Los Angeles - Vicksburg	Vert	3	120	4,700
Monrovia - San Gabriel	V.T.	2(2)	1,200	12,000
Monrovia - Ridgeside	Sub	4(1)	250	2,400
Monrovia - May Avenue	Sub	2(2)	500	6,000
Newport Beach - San Gabriel	—	—	—	—
Newport Beach - Sierra Drive	V.T.	2	30	400
Newport Beach - Big Canyon	V.T.	4	115	2,750
Ontario - Sewage	V.T.	2(2)	140	3,500
Ontario - Magnolia Avenue Sewage P.S.	Vert	2	30	1,200
Pasadena	—	—	—	—
Pomona	—	—	—	—
Pomona-Reclaimed Water Hi-Lift P.S.	V.T.	2(1)	200	2,700
Pomona-Reclaimed Water Low-Lift P.S.	V.T.	2(2)	80	6,000
Rancho California WD - Buck Mesa P.S.	V.T.	4	350	4,200
Reedy Creek I.D. - Pumping Station A	Cent	5	750	12,000
Sacramento - No. 1	Horiz	3	150	12,600
Sacramento - No. 2	Horiz	3	150	12,600
Sacramento - No. 3	Horiz	3	150	12,600

REPRESENTATIVE LIST OF PUMPING STATIONS
(Continued)

Client	Type	Pumps No. (fut.)	Design hp	Design gpm
Sacramento - Riverside Hi-Lift	Sub	4	1,050	25,000
Sacramento - Riverside Low-Lift	V.T.	3	125	19,200
Sacramento - American River Hi-Lift	V.T.	6	4,200	105,000
Sacramento - American River Low-Lift	V.T.	5	1,050	73,000
Sacramento - Florin Reservoir P.S.*	Horiz	3(3)	1,800	38,500
Saigon-Vietnam - Elec. Driven	V.T.	6	13,500	165,000
San Diego No. 2 - Sewage	Vert	4(4)	18,000	250,000
San Diego No. 1 - Sewage	Vert	3(3)	3,600	170,000
San Diego, Miramar - Raw Water	V.T.	6	13,500	42,000
San Dieguito/Rancho Santa Fe Dist. Pumps and Mechanical Equipment for San Dieguito Addition	V.T.	2	1,000	8,400
San Francisco - San Antonio P.S.	V.T.	4	3,500	55,500
San Francisco - Sunol P.S.	V.T.	4	1,995	20,800
San Francisco - Crystal Springs P.S.	—	—	—	56,000
Santa Ana - West Reservoir	—	—	900	—
Santa Ana - South Reservoir	—	—	1,250	16,000
Santa Ana - Bristol St. P.S. Addition	V.T.	3	550	8,800
Santa Ana - Cambridge Reservoir P.S.	V.T.	3(1)	300	6,600
Santa Ana - East Reservoir P.S.	V.T.	2(2)	500	9,200
Santa Ana - 1st Street	—	5	850	12,800
Santa Ana - Bristol Street	—	—	850	15,100
Santa Fe Irrigation District-San Dieguito Reservoir P.S. Addition	V.T.	3	1,250	10,500
Santa Monica - San Vicente	Sub	6	545	9,100
Santa Monica - Arcadia	Sub	5	675	12,100
Santa Monica - Charnock	V.T.	6(2)	770	13,760
Santa Rosa Ranches WD - Grand Avenue	V.T.	3	600	1,950
Santa Rosa Ranches WD - Calle Capistrano P.S.	V.T.	1(3)	75	1,000
Systems No. 3, Inc., Florida	Vert.	2(1)	600	7,000
Torrance	V.T.	3	150	2,100
Upland - 15th Street	V.T.	2(2)	500	6,000
Upland - 19th Street	V.T.	2(2)	500	5,000
Upland - 22nd Street	V.T.	2(2)	500	5,000
Upland - 2nd Phase Improvements at E. 16th Street	V.T.	2(1)	300	4,950
Valley Water Company - Flintridge	—	2(1)	120	900
Valley Water Company - Main	—	6	750	6,450
Ventura - Seawater Intake	V.T.	1	20	350
Ventura - Modella	V.T.	3	75	1,500
Ventura - Buena Vista	Horiz	4	140	1,500
Ventura - Golf Course	V.T.	3(1)	725	5,700
Vernon - Civic Center Reservoir P.S.	V.T.	5(1)	1,260	13,700
Vernon - No. 2	—	3	320	4,600
Vernon - No. 3	—	3	320	4,600

REPRESENTATIVE LIST OF PUMPING STATIONS
(Continued)

Client	Type	Pumps No. (fut.)	Design hp	Design gpm
Yorba Linda - No. 1	Horiz	3(1)	500	8,000
Yorba Linda - No. 2	Sub	3(1)	500	7,600
Yorba Linda - No. 3	V.T.	4	235	4,000
Yorba Linda - East Side P.S.	V.T.	2(2)	4,600	9,200

NOTES:

Design hp and design gpm includes future pumps.
( ) indicates number of future pumps to be installed.
V.T. = Vertical Turbine
Sub = Submersible
Horiz = Horizontal Centrifugal
Vert = Vertical Centrifugal
*Gas Engine Drives

REPRESENTATIVE LIST OF PIPELINES

Agency	Length Feet	Pipe Diameter (inches)
Avalon, California, City of	27,000	4 to 12
Bellflower County Water District	21,000	16 to 24
Beverly Hills, California, City of	42,000	6 to 24
Boulder City, California, City of	95,000	6 to 18
Buena Park, California, City of	216,000	6 to 36
Chino Basin Municipal Water District	185,000	12 to 42
Costa Mesa County Water District	58,000	18 to 42
Covina, California, City of	7,500	16 to 18
Crescenta Valley County Water District	21,000	10 to 16
Cucamonga County Water District	222,000	8 to 24
Florida Keys Aqueduct Authority, Florida	58,000	6 to 8
Foothill Municipal Water District	42,000	24 to 39
Fountain Valley, California, City of	138,000	8 to 16
Fullerton, California, City of	21,000	24 to 42
Goleta County Water District	74,000	8 to 33
Guyana, Government of	159,000	4 to 16
Inglewood, California, City of	16,000	18 to 24
Irvine Ranch Water District	5,000	60 to 72
Jamaica, Government of - West Indies	1,500,000	4 to 18
Las Vegas Valley Water District	650,000	6 to 72
Metropolitan Water District of Southern California	5,000	144
Monrovia, California, City of	32,000	20 to 24
Monterey Park, California, City of	14,000	12 to 18
Newport Beach, California, City of	21,000	18 to 30
North Lauderdale, Florida, City of	3,500	16 to 24
North Lauderdale, Florida, City of	11,700	12
Oceanside, California, City of	23,000	24
Opa Locka, Florida, City of	2,700	10
Pembroke Pines, Florida, City of	11,500	14
Pembroke Pines, Florida, City of	4,000	12 to 30
Pomona, California, City of	37,000	16 to 36
Pomona-Walnut-Rowland Joint Water Line Commission	16,000	54 to 60
Rancho California	200,000	4 to 24
Rancho California	800	12 to 24
Salton Sea Water District	132,000	12 to 14
San Diego, California, City of (sewage system)	116,000	42 to 114
San Dieguito Irrigation District	37,000	30 to 54
San Gabriel Valley Municipal Water District	200,000	30 to 54
Santa Barbara, California, City of	42,000	24 to 42
Santa Monica, California, City of	27,000	16 to 36
Sao Paulo, Brazil	300,000	24 to 84
Southern California Edison Company	32,000	4 to 8
Systems No. 3, Inc., Florida	13,200	24
Torrance, California, City of	200,000	8 to 24
Upland, California, City of	95,000	6 to 24
Ventura, City of	110,000	8 to 30
Ventura River Municipal Water District	21,000	33
West Covina-Walnut Water Company	37,000	27 to 30
Yorba Linda County Water District	16,000	6 to 12

Arcadia, California, City of
Avalon, California, City of
Azusa, California, City of
Bangladesh, Government of (East Pakistan)
Bellflower, California, City of
Bellflower County Water District
Beverly Hills, California, City of
Boulder City, Nevada, City of
Buena Park, California, City of
Burbank, California, City of
Carson City, Nevada, City of
Chino Basin Municipal Water District
Claremont, California, City of
Colorado River Commission of Nevada
Contra Costa County Water District
Costa Mesa, California, City of
Costa Mesa County Water District
Cucamonga County Water District
Duarte Domestic Water Company
East Bay Municipal Utility District
El Centro, California, City of
Fallbrook Public Utility District
Fountain Valley, California, City of
Fullerton, California, City of
Garden Grove, California, City of
Goleta County Water District
Goleta Sanitary District
Guyana, Government of
Henderson, Nevada, City of
Hewitt Ranch
Home Savings and Loan Association
Inglewood, California, City of
Indonesia, Republic of
Iomosa Water Company
Irvine Company
Jamaica, Government of
Jet Propulsion Laboratory
Laguna Beach, California, City of
La Habra, California, City of
Las Flores Water Company
Las Vegas Valley Water District, Nevada
Lauderhill, Florida, City of
LaVerne, California, City of
Marquez Knolls
McCarran Airport, Las Vegas, Nevada
Moffatt and Nichol
Mojave Utility District
Monrovia, California, City of
Montclair, California, City of

REPRESENTATIVE LIST OF MASTER PLANS AND FEASIBILITY STUDIES
(Continued)

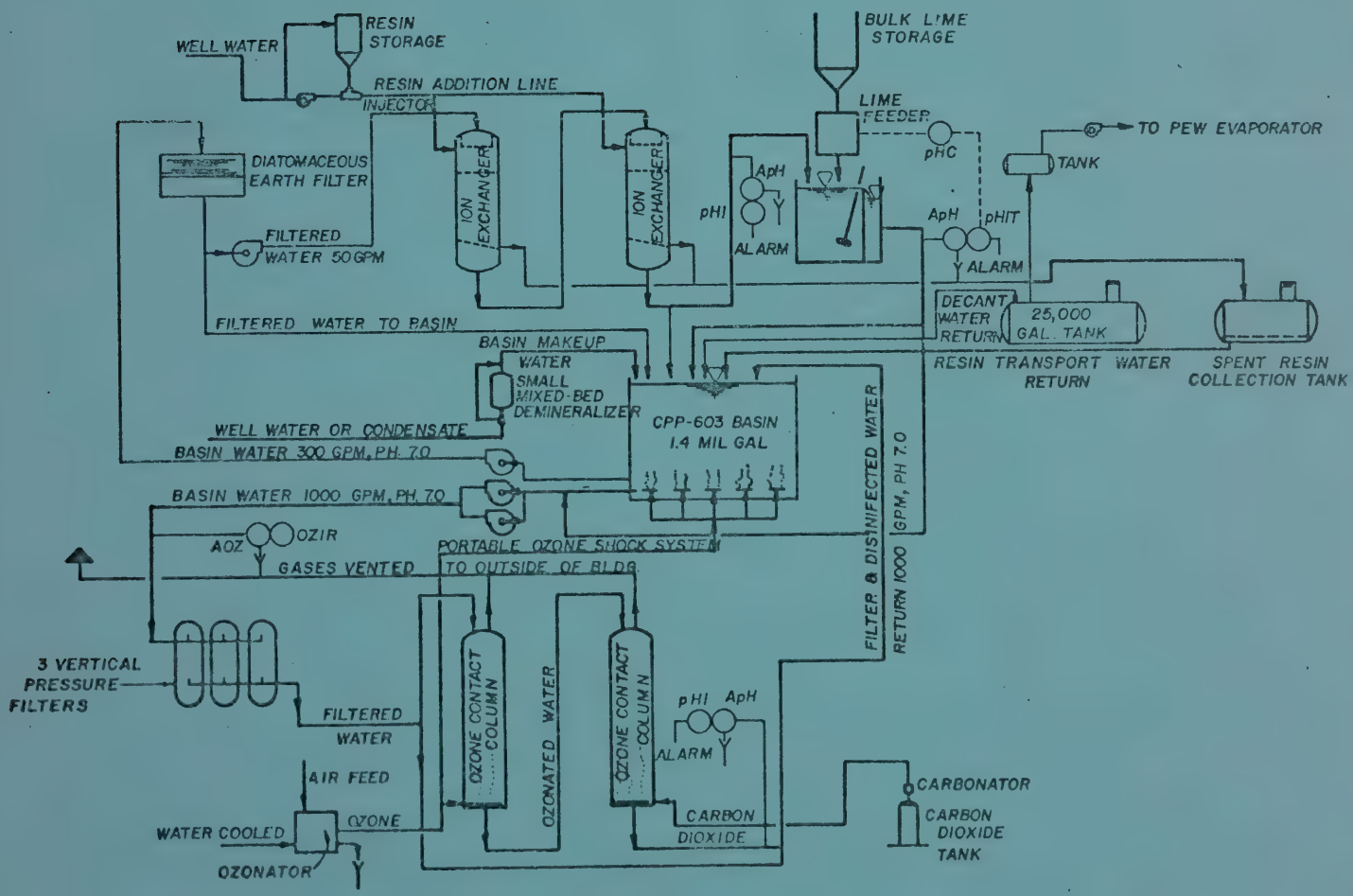
Monte Vista County Water District
Monterey Park, California, City of
Mt. Charleston Utilities, Inc., Las Vegas, Nevada
Muir, Robert
Newhall Land and Farming Company
Newport Beach, California, City of
North American Aviation
North Lauderdale, Florida, City of
Ojai, California, City of
Ontario, California, City of
Opa Locka, Florida, City of
Pardee Construction Company
Philippines, Republic of
Pico Rivera, California, City of
Pomona, California, City of
Pomona Valley Municipal Water District
Pomona Valley Protective Association
Quartz Hill County Water District
Rancho California Water District
Redlands, California, City of
Sacramento, California, City of
Salton Sea Water District
San Clemente, California, City of
San Diego, California, City of
San Dieguito Irrigation District
San Fernando, California, City of
Santa Ana, California, City of
Santa Barbara, California, City of
Santa Fe Irrigation District
Santa Fe Springs, California, City of
Santa Paula, California, City of
Semi-Tropic County Water District
Shell Chemical Company
Sierra Madre, California, City of
Southern California Edison Company
Southwest Gas Corporation, Carson City, Nevada
Sunkist Growers Association
Torrance, California, City of
Torrance Municipal District No. 3
U.S. Navy, Camp Pendleton
Upland, California, City of
Ventura, California, City of
Vernon, California, City of
Vista Irrigation District
WED Enterprises, Inc. (Disneyland and Disney World)
West Covina, California, City of
West Covina-Walnut Water Company
Westminster, California, City of
Yemen, Arab Republic
Yorba Linda County Water District

REPRESENTATIVE LIST OF RATE AND FINANCIAL ANALYSIS STUDIES

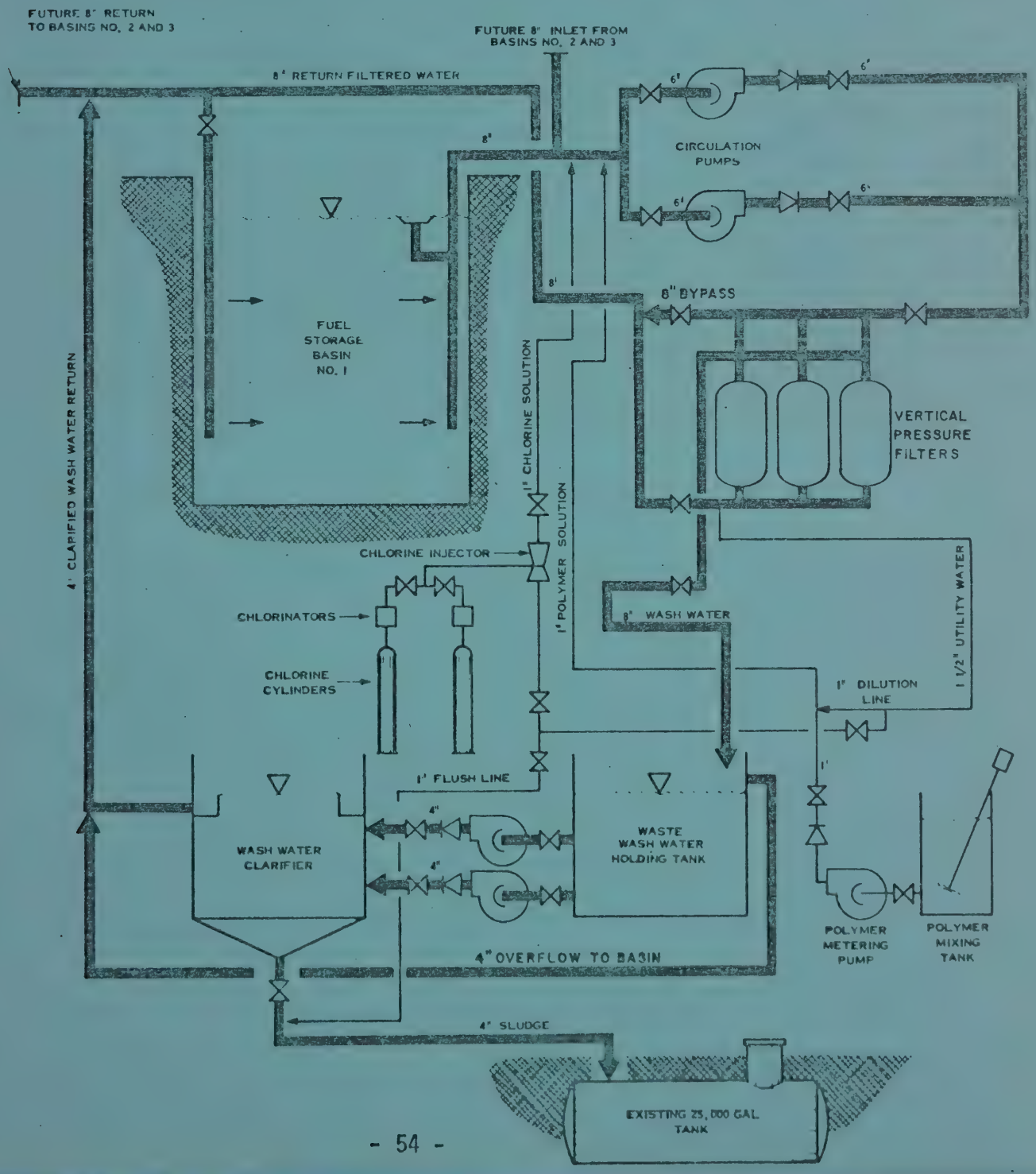
American Potash and Chemical Corporation
Azusa, California, City of
Azusa Irrigating Company
Azusa Valley Water Company
Basic Management, Inc.
California Domestic Water Company
Chino Basin Municipal Water District
Contra Costa County Water District
Costa Mesa County Water District
Covina, California, City of
Covina Irrigating Company
Crestmore Village Water Company
Cucamonga County Water District
Disney World, Florida
El Centro, California, City of
El Monte, California, City of
Escondido Mutual Water Company
Glendora Irrigating Company
Las Vegas Valley Water District, Nevada
Lytle Creek Water and Improvement Company
Monrovia, California, City of
Mountain Properties, Inc.
Nevada Irrigation District
North Cucamonga Water Company
Palm Springs Water Company
Pomona, California, City of
Pomona Valley Water Company
Rancho Las Posas Water Company
Sacramento, California, City of
San Buenaventura, California, City of
San Dieguito Irrigation District
San Dimas, California, City of
San Dimas-Charter Oak Domestic Water Company
San Dimas Water Company
San Fernando, California, City of
Safford, Arizona, City of
Santa Fe Irrigation District
Torrance, California, City of
Transamerica Development Company
Tustin Water Works
Upland, California, City of
Vernon, California, City of
West Covina, California, City of
Yorba Linda County Water District

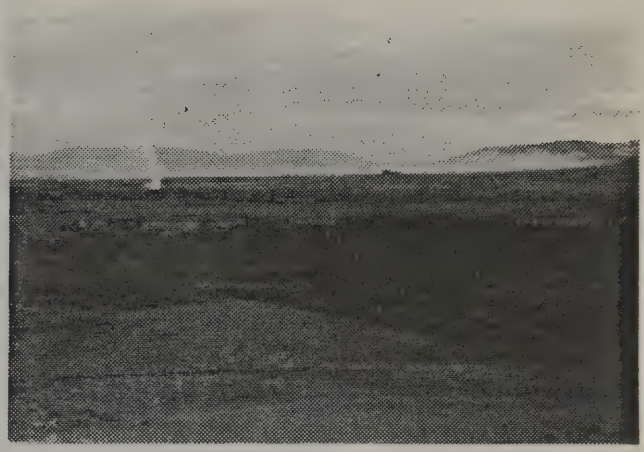
ATOMIC ENERGY COMMISSION

The Atomic Energy Commission maintains a spent nuclear fuel reprocessing facility near Idaho Falls. Radioactive materials are stored under water until such time as they can be chemically processed and the usable material reclaimed. Because of the critical nature of the materials being handled, it is imperative to maintain a high clarity in the storage basins where technicians must work with these stored waste products. Because of the addition of chlorine for algae control and the accumulation of other minerals, the waters of the basin were becoming corrosive to reprocessing equipment. Montgomery Engineers was retained to study the water quality characteristics of the basin and to design facility modifications by which the corrosion problems could be eliminated. The study centered around an evaluation of potential demineralization processes to find a system which would produce the smallest amount of waste residual. The design consisted of ion exchange apparatus, the elimination of chlorine equipment, the addition of an ozonator and pH control, and the installation of a spent resin recovery system.



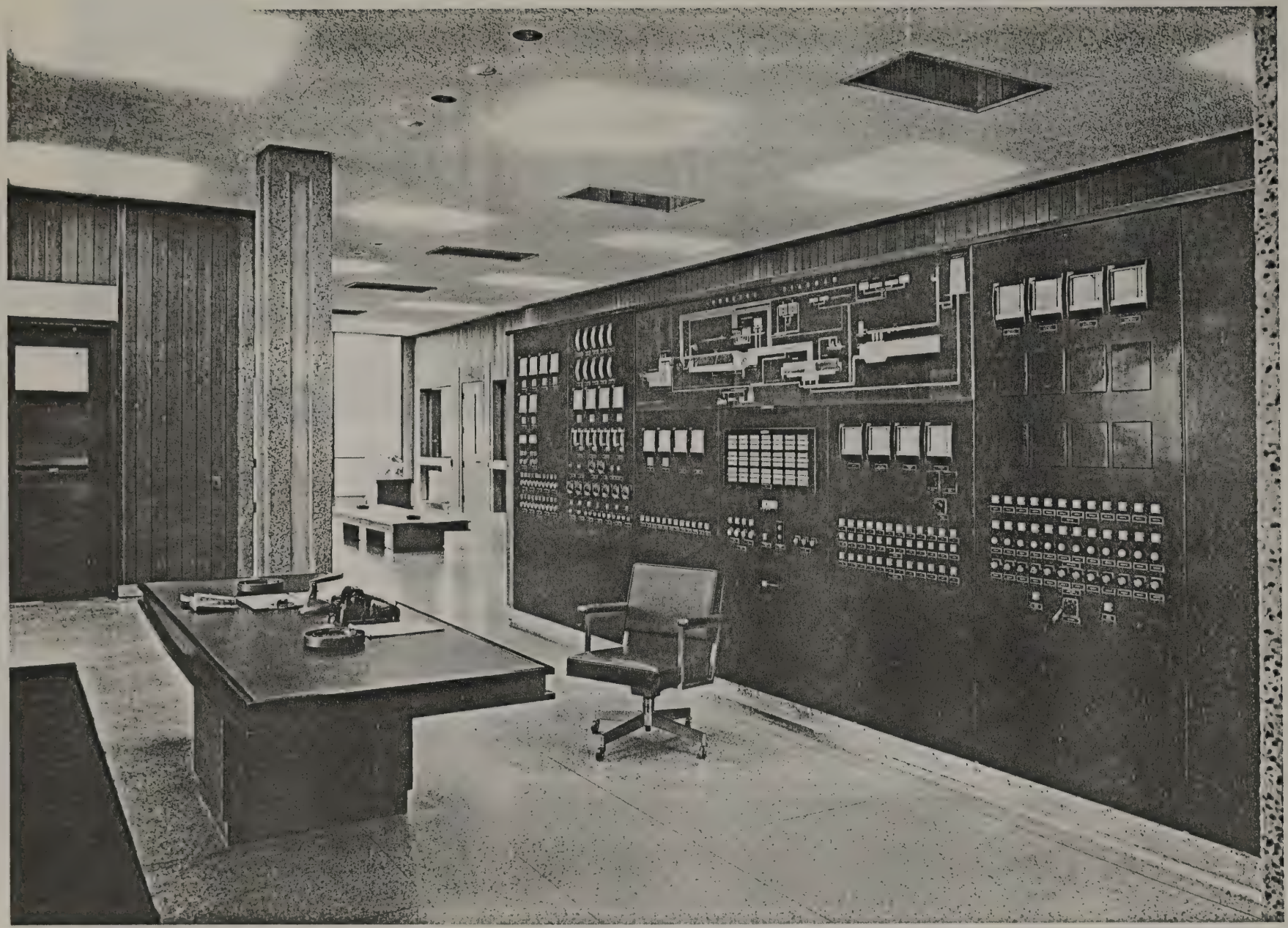
The Atomic Energy Commission in Idaho Falls, Idaho, contracted with JMM to conduct a study on the water quality problems within their spent fuel storage and processing basins, and to design water treatment modifications to provide the high clarity water necessary for the operation of the facility. The design included high rate pressure filtration, clarification, chemical addition, and all controls, instruments, protective equipment and structures necessary for a safe, completely automated operation. The rated capacity of the system is 1000 gpm, which provides complete filtration of the basin every 10 hours with a resultant filter effluent of less than 0.3 JTU. This degree of clarity will enable radioactive waste products to be handled and physically processed under water, and provide for the removal of suspended particulate nucleotides upon backwash and clarification of the washwater. The entrapped particles after sedimentation are drained off to an underground storage tank.





V. A. CENTER, FT. HARRISON, MONTANA

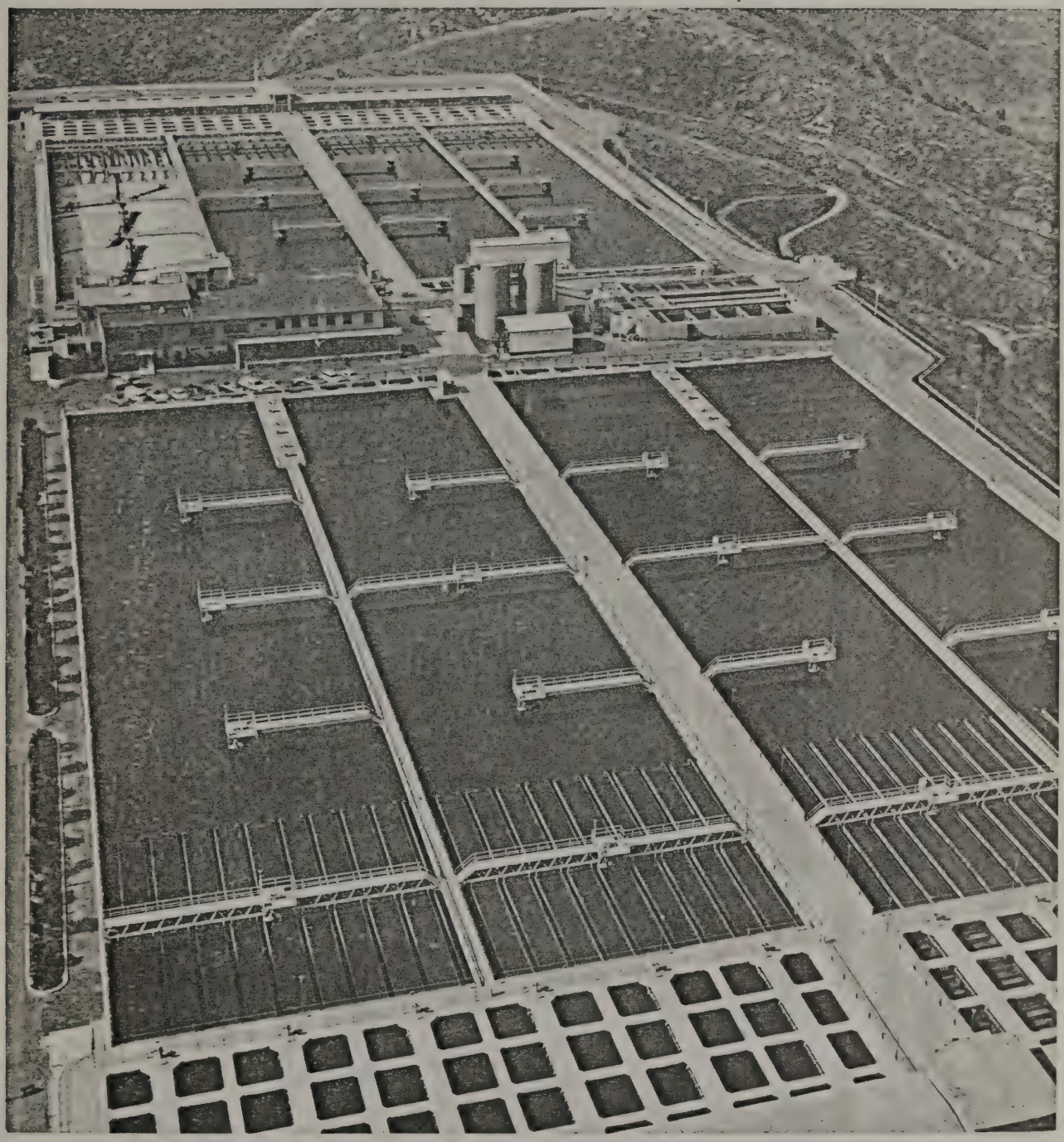
The V. A. Center at Fort Harrison, Montana, had JMM prepare an engineering feasibility and economic study of their water supply system. The study reviewed surface and subsurface water rights relative to development and undertook a well drilling pumping and testing program to evaluate the availability of potable and irrigation water. Historic and current water use records were reviewed and future water needs projects; these included future annual, monthly and maximum daily demands. The existing transmission and distribution lines and storage facilities were evaluated relative to the projected demands, fire flow requirements and emergency storage. A detailed engineering and cost evaluation was made of six alternatives to determine the most cost effective project. The alternatives included development of ground and surface water supplies and purchasing water from the City of Helena. Initial capital costs, maintenance and operation costs, and water rates were developed for each alternative. All alternatives sources of supply were evaluated relative to their chemical and aesthetic quality and conformance with existing and proposed water quality standards.



CONTRA COSTA COUNTY WATER DISTRICT

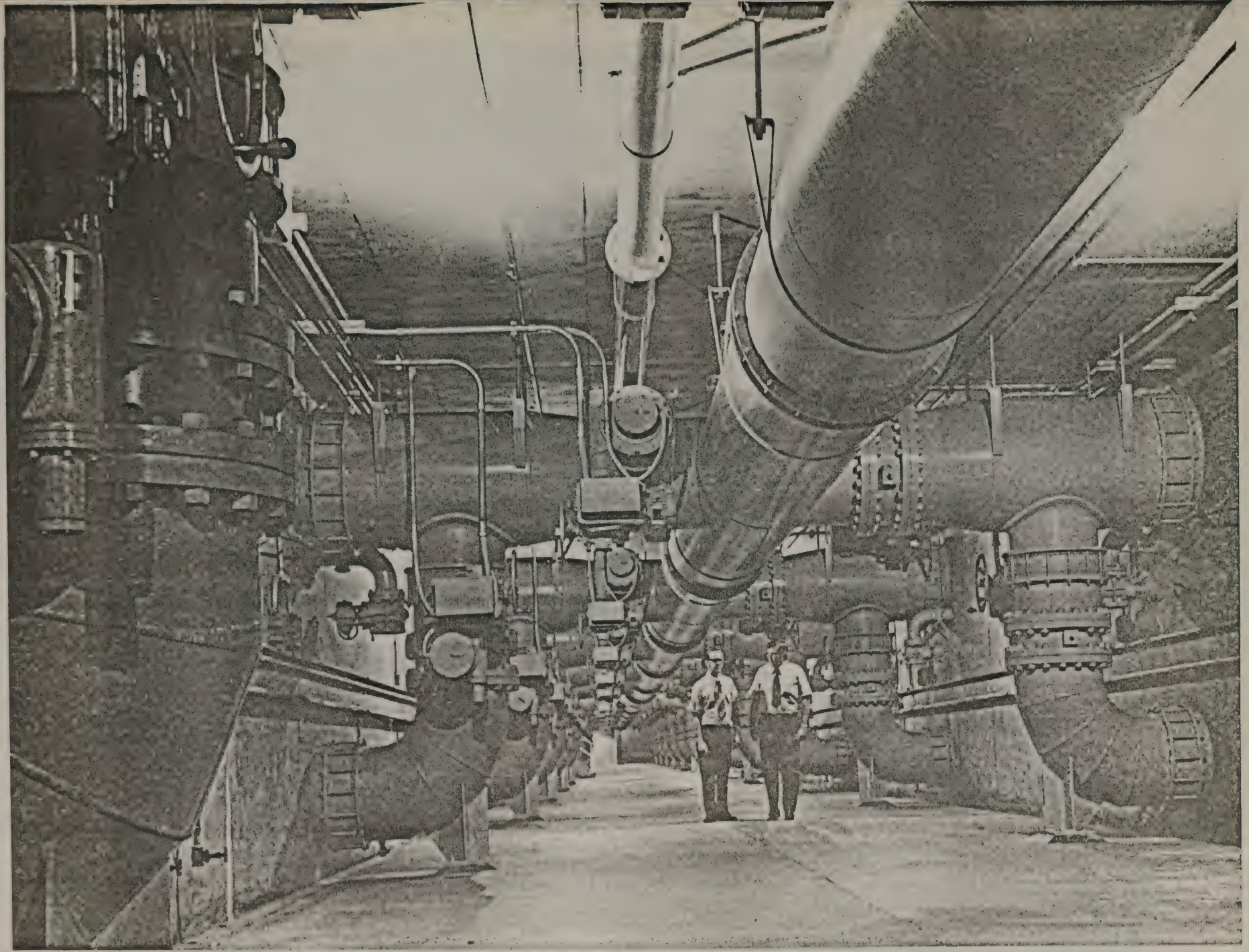
Ralph D. Bollman Plant Central Control Panel

METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
ROBERT B. DIEMER FILTRATION PLANT–HEADHOUSE



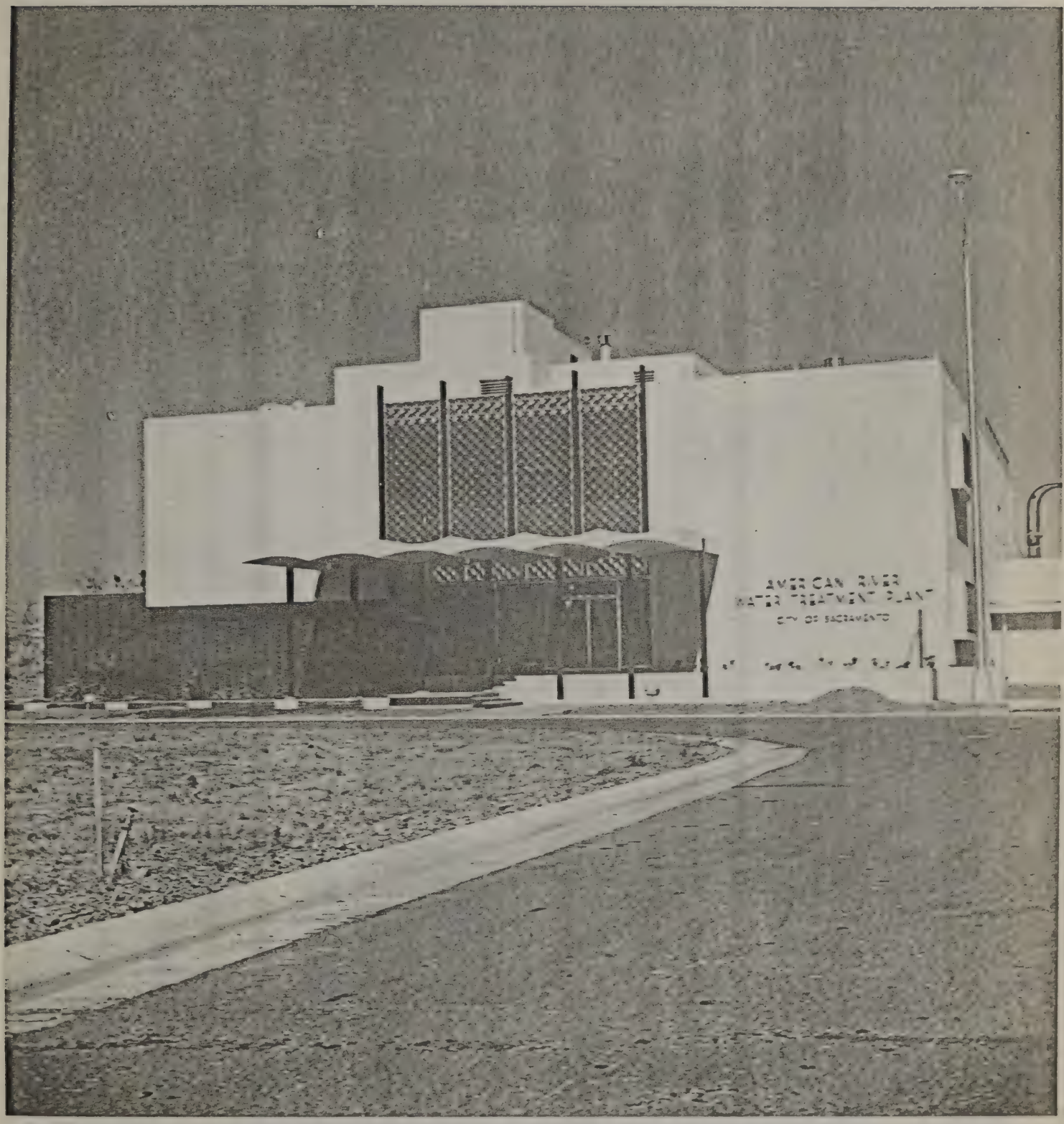
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Robert B. Diemer Filtration Plant - Filters (in foreground)



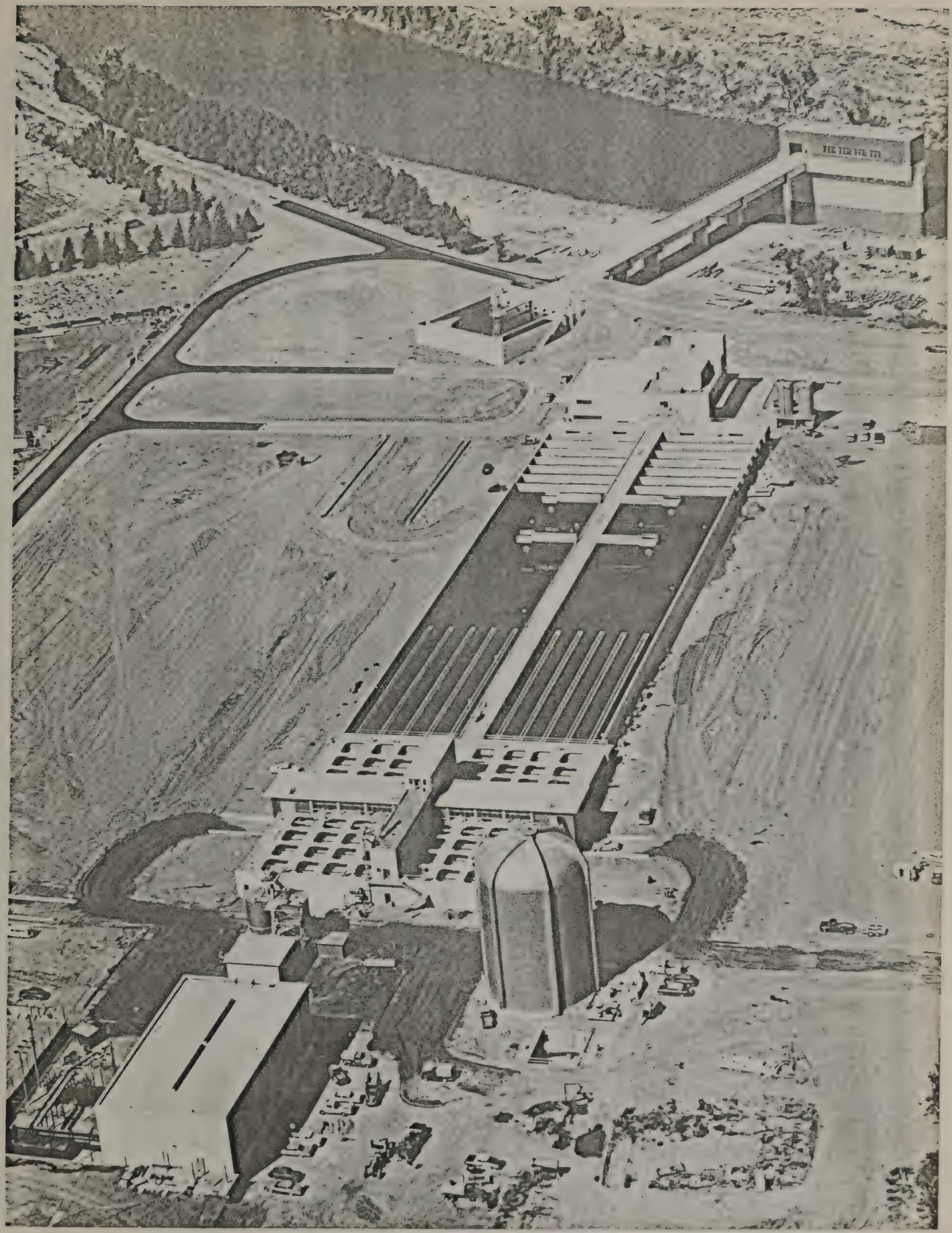
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

Robert B. Diemer Filtration Plant - Filter Pipe Gallery



CITY OF SACRAMENTO
AMERICAN RIVER WATER TREATMENT PLANT–HEADHOUSE

JAMES M. MONTGOMERY, CONSULTING ENGINEERS, INC.



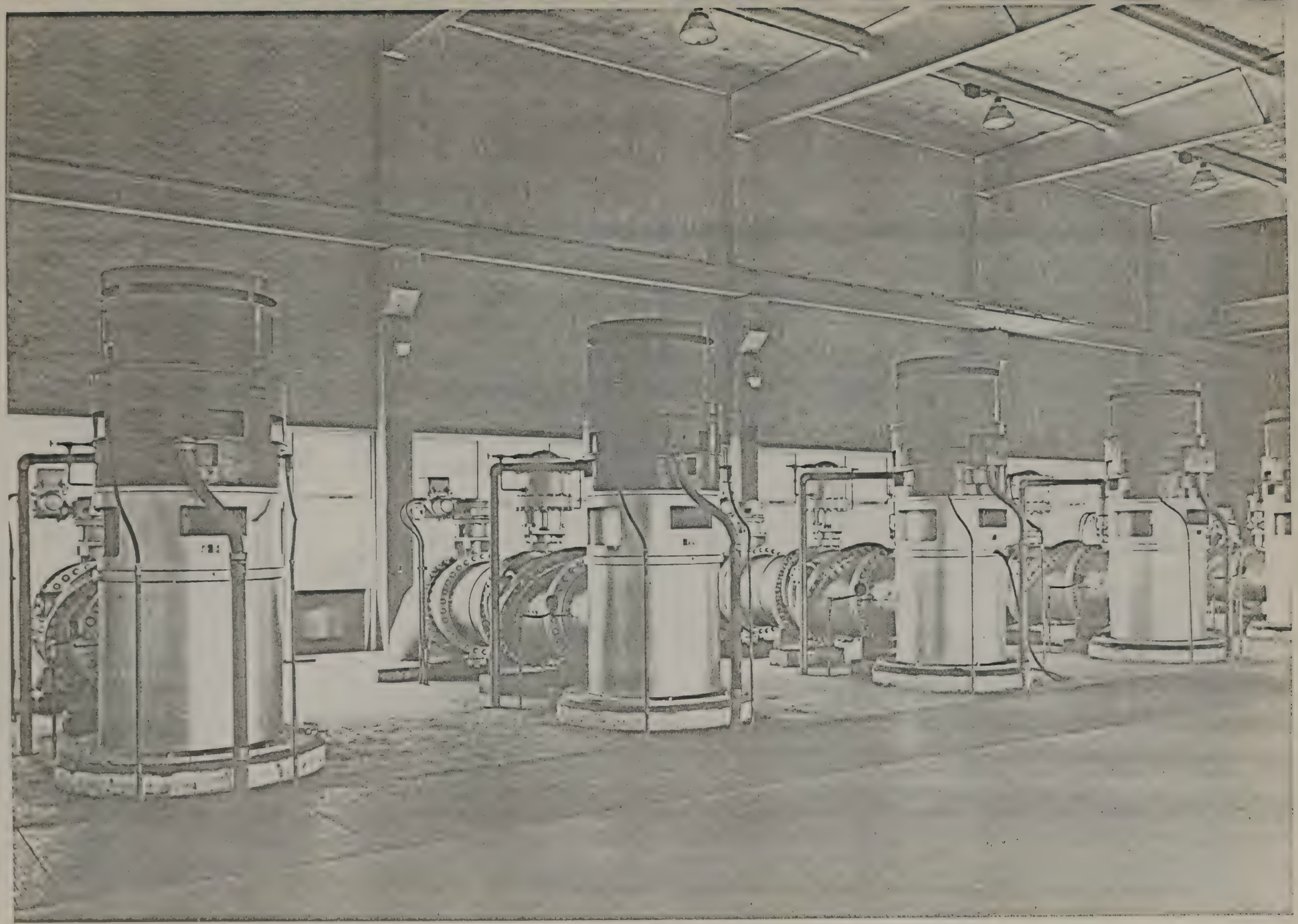
CITY OF SACRAMENTO
72 MGD AMERICAN RIVER FILTRATION PLANT
Ciudad de Sacramento
Planta de Filtración Río American Capacidad: 3.2 M^3/seg.

CITY OF REDLANDS

2 mg Capacity Reservoir

CITY OF BEVERLY HILLS

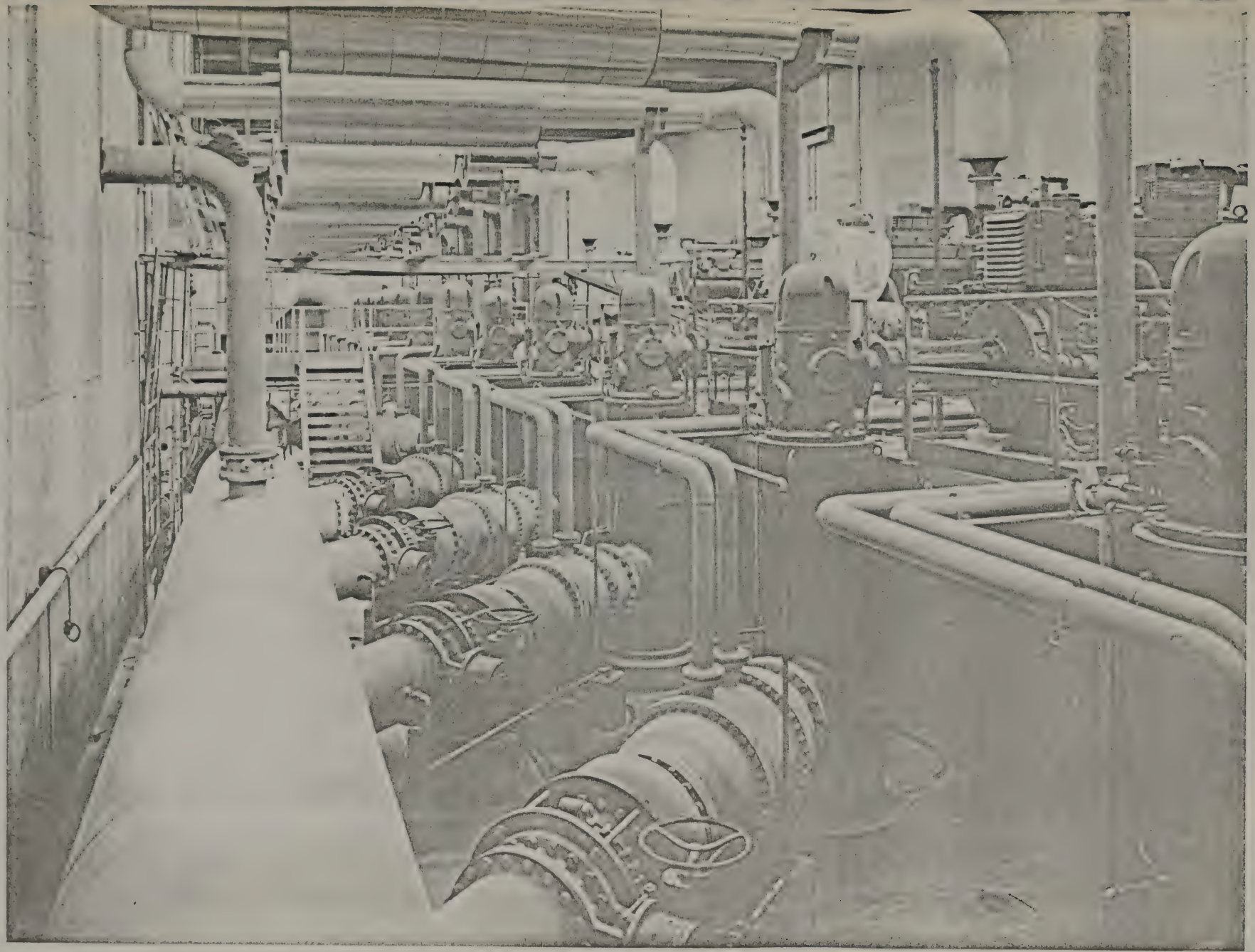
Greystone Reservoir - 19.3 mg Capacity



CITY OF SACRAMENTO

American River Filtration Plant - High-Service Pumping Station

Initial Capacity: 45,000 gpm



LAS VEGAS VALLEY WATER DISTRICT

Natural Gas Engines Drive Turbine Pumps to
Supply 84,000 gpm into Discharge Header

LAS VEGAS VALLEY WATER DISTRICT

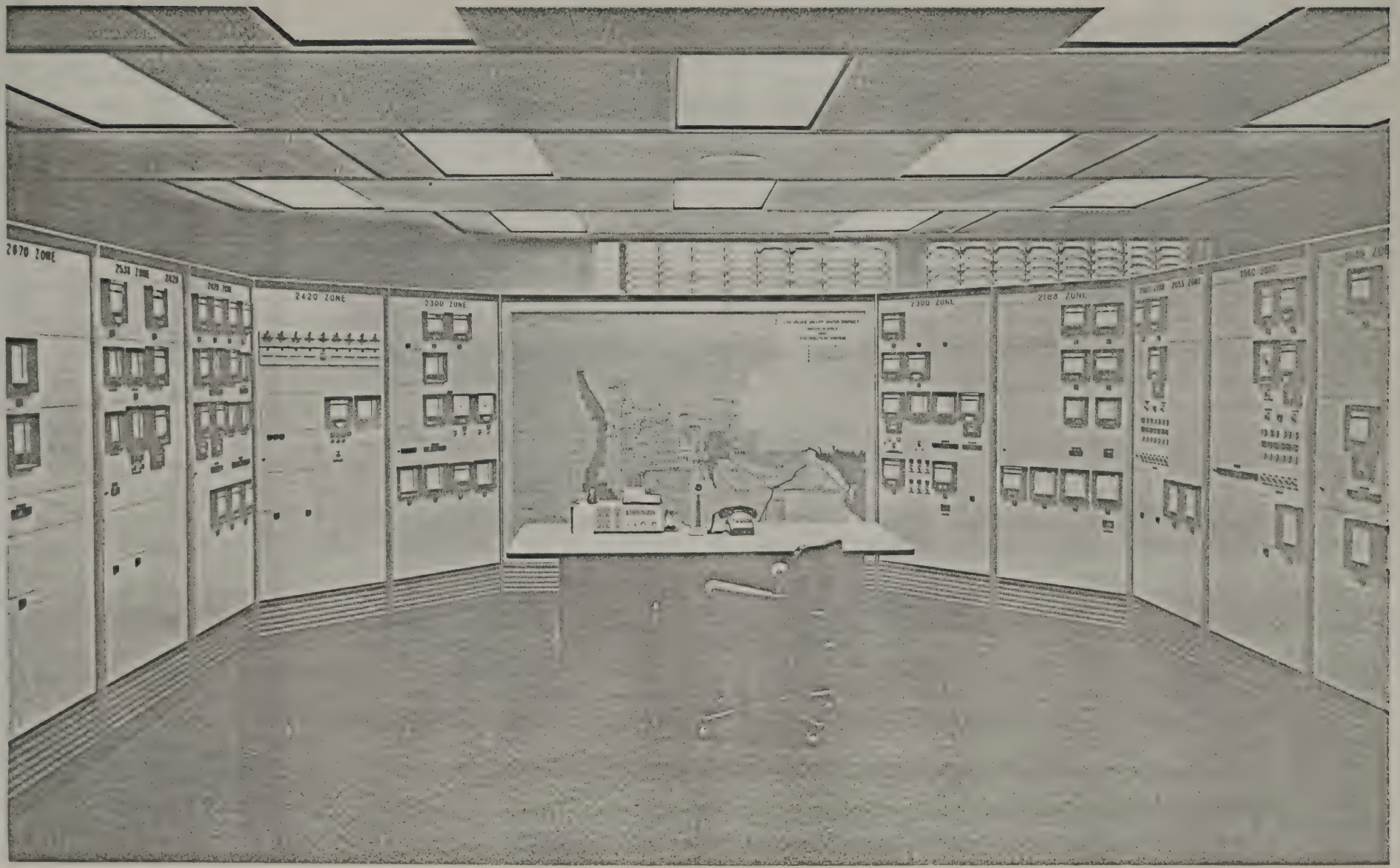
60-Inch Diameter Sandhill-Lamb Transmission Main

SALTON SEA WATER DISTRICT

132,000 Ft - 12-14 Inch Pipe

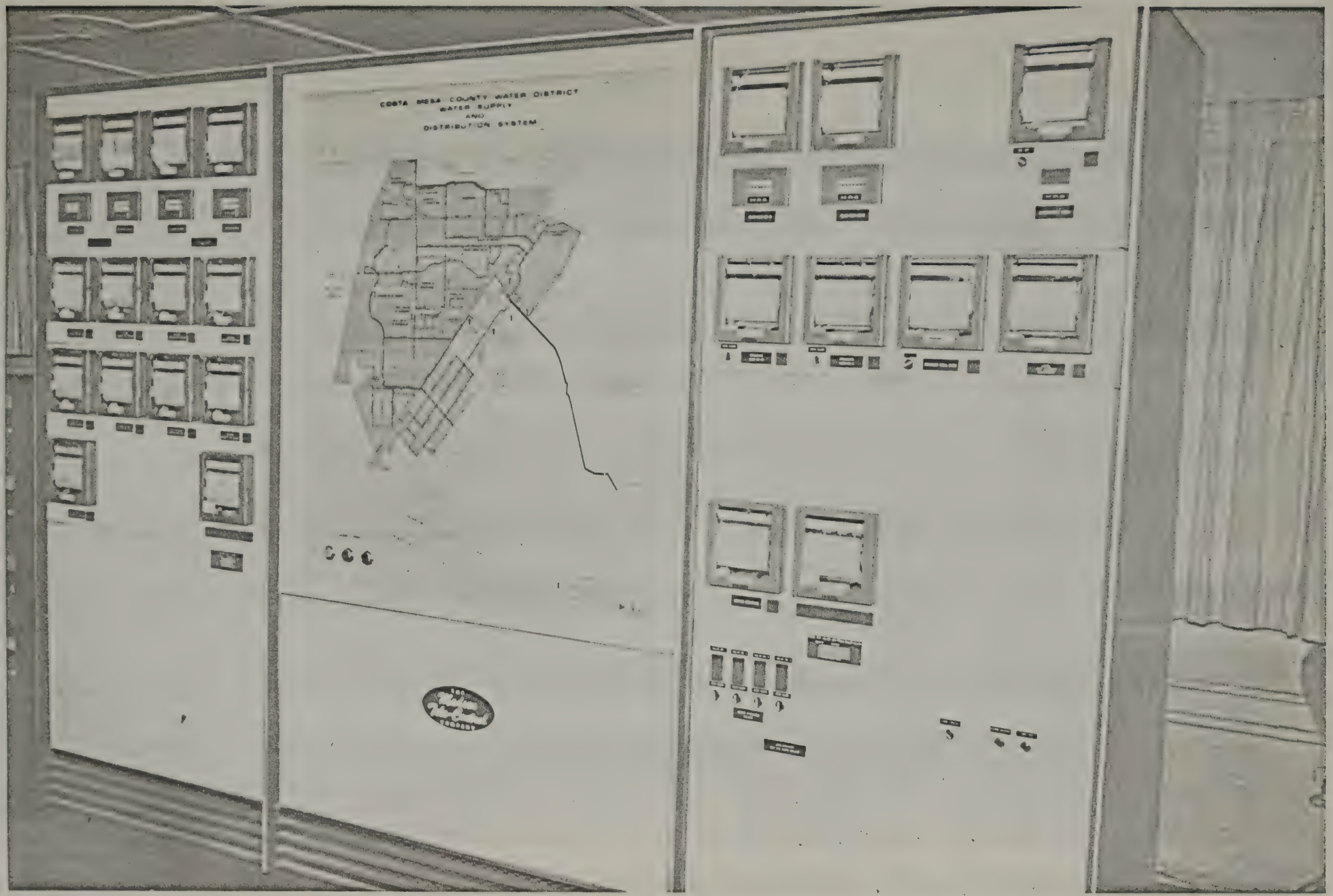
CONTRA COSTA COUNTY WATER DISTRICT

48 to 66 and 96 Inch Pipe



LAS VEGAS VALLEY WATER DISTRICT

Telemetering Panel



COSTA MESA COUNTY WATER DISTRICT

Central Telemetry Board

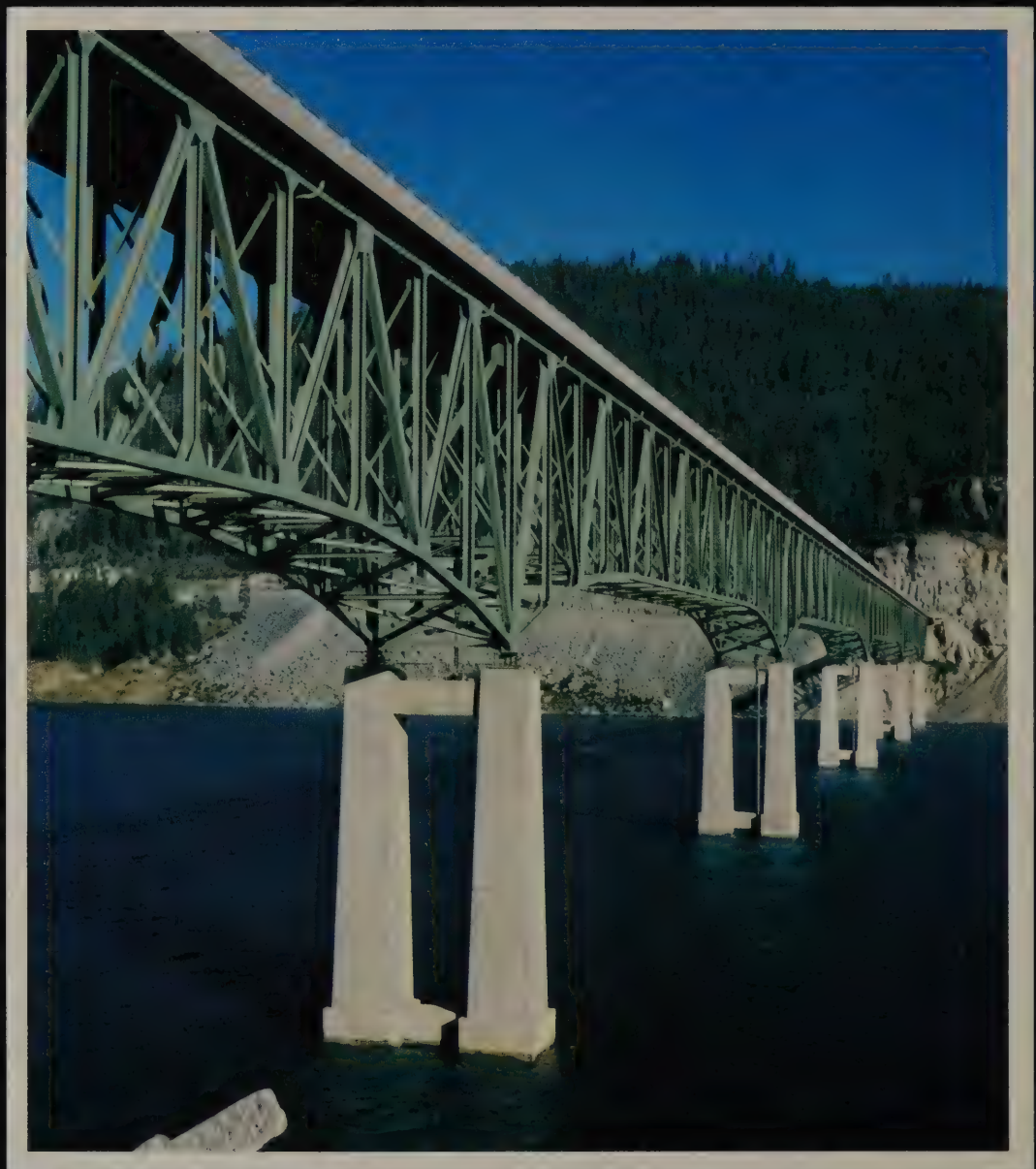
BROCHURES

MORRISON-MAIERLE, INC./CONSULTING ENGINEERS

Honored for bridge design.

Morrison-Maierle, Inc. won the 1972 Prize Bridge Award sponsored by the American Institute of Steel Construction for its design of the Lake Koocanusa Bridge at Libby, Montana. The Prize Bridge Award was in the Long Span category in the national competition.

In 1975, another Morrison-Maierle, Inc. bridge design won its division in the national AISC competition. Placing first among Medium Span, Low Clearance entries was Morrison-Maierle's design of the South Fork - Flathead River Bridge, located at the head of Hungry Horse Reservoir in Montana. A photo of this bridge is shown elsewhere in this brochure.



The prize-winning bridge over Lake Koocanusa.

What the consulting engineer can do for your project.

The consulting engineer is a licensed professional with special training and expertise in one or more disciplines. He subscribes to a Code of Ethics prohibiting affiliation with any supplier, contractor or other commercial interest. Hence, the consulting engineer brings qualified, unbiased judgment to any project for which he is retained.

Morrison-Maierle, Inc. ranks among the top 15 percent of engineering firms in the U.S. in volume of design work. Its diverse range of services includes studies of feasibility, costs and benefits. The firm conducts design planning and implementation, maintains quality control of construction and construction materials, and provides operations management services for clients.

As qualified consultants, Morrison-Maierle, Inc. can evaluate every aspect of your project from inception to completion, recommending appropriate action based on your particular needs and circumstances.

One of the top 500.

Morrison-Maierle ranks among the 500 largest design firms in the U.S., according to Engineering News-Record's annual survey.

Morrison-Maierle: Quality engineering throughout the West.

Morrison-Maierle, Inc. provides consulting engineering service for many types of projects throughout the Rocky Mountain West.

With a home office in Helena, Montana, branch offices in Billings, Bozeman and Kalispell, Montana and Farmington, New Mexico, and an associated firm in Salt Lake City, Utah, Morrison-Maierle offers broad professional capabilities. The skill of its engineers, coupled with their ready availability across six sprawling states, creates efficiency for the firm and often develops substantial savings for its clients.

All offices are staffed by qualified technical personnel working under the direction of registered professional engineers.

Morrison-Maierle also has designed and supervised overseas projects, under contract with the U.S. Agency for International Development. An officer of the firm has lived in South Vietnam while being responsible for design and contract administration of highway and bridge construction.

Home office:
Helena, Montana

Branch offices:
Billings, Montana
Bozeman, Montana
Kalispell, Montana
Farmington, New Mexico

Associated firm:
Morrison-Maierle & Preator, Inc.
Salt Lake City, Utah

Behind the scenes:

On the job in Vietnam.

A team of five Morrison-Maierle engineers completed design work on substantial numbers of South Vietnamese bridges and highways before the Central Highlands were lost to invaders. Operating in Southeast Asia, and supervising Vietnamese engineers and technicians, proved valuable experience to key Morrison-Maierle personnel who were assigned to the project from one to two years.

A skilled office staff.

Slip past the Morrison-Maierle receptionist and suddenly you're in a modern printing plant! There's an automatic typewriter, setting letter-perfect copy. Headlines are composed on a Varitype printer. A modern Multilith press is clicking away. These are important tools at Morrison-Maierle as engineering is translated into communication. A comprehensive report may require 150 pages, including fold-out multicolor maps and charts.

Electronic Computing speeds the work.

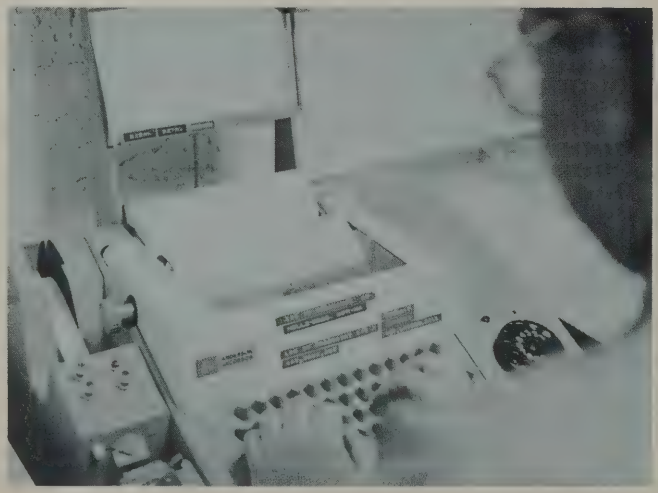
Electronic computers have changed the method and quickened the speed of accomplishing most engineering design work. Mathematical solutions are more easily and accurately calculated. Problems too laborious for the slide rule or mechanical calculator are quickly handled by these electronic systems.

Morrison-Maierle has immediate access to several computers through computer input terminals right in its own offices. In fact, this firm helped establish Western Telecomputing Corporation, a Montana company providing time-share computing through telephone circuits. This service is used extensively by Morrison-Maierle engineers in analyzing problems.

Morrison-Maierle's time-share terminal is also used to communicate with the impressive Sigma Seven computer at Montana State University, Bozeman.

Computer input at Morrison-Maierle.

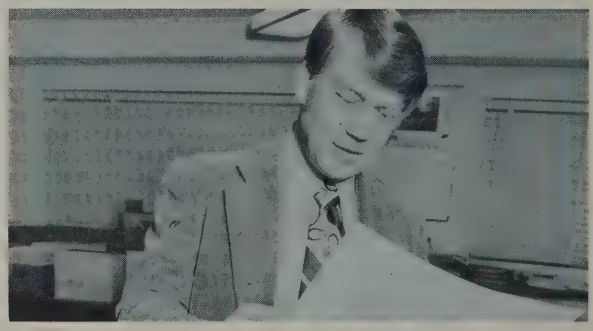
Through this keyboard in the Morrison-Maierle offices, professional engineers have quick access to a variety of electronic computers. The firm shares time on a third generation computer, with multichannel system, at Western Telecomputing Corporation.



Still other computer centers, with specific or unusual capabilities, are used for specific projects such as river basin analysis and groundwater studies.

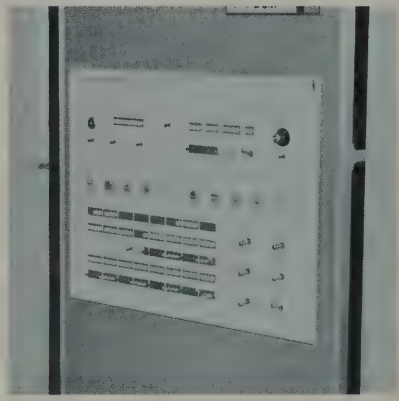
Electronic computing is another learned skill which helps Morrison-Maierle engineers solve client problems.

Larry Larsen, professional engineer and manager of the Morrison-Maierle office at Billings, has extensive experience in using computers for highway and road designs.



Plugging into the Sigma 7.

Owned and operated by Montana State University, the Sigma 7 is another computer on which Morrison-Maierle leases time.



Morrison-Maierle personnel are experienced in all facets of recreation area engineering, including skiing and campgrounds.

Recreation areas with eye appeal.

Morrison-Maierle recognizes that creating facilities in harmony with the environment is the first requisite in recreational engineering today.

The firm has experience in many of the leading recreational projects in the West, and has used its expertise in fields of civil, sanitary and structural engineering to develop facilities from small campgrounds to multifaceted vacation communities.

The sewage collection and treatment design, and much of the water system planning for Chet Huntley's Big Sky development was engineered by Morrison-Maierle. Big Sky Campers' Village, a modern campground in tune with its wilderness setting, was also designed by the firm and provides 175 units for trailers or tents.

Morrison-Maierle engineers recently designed a 240-unit campground at West Yellowstone, and provided subdivision platting and water and sewer planning for casting ponds and cabin sites near Targhee Pass, developed by the Fenwick Tackle Company.

The Montana Fish and Game Department has retained the firm to plan roadside picnic areas on state land. Rest areas have been included in several of the firm's highway designs.

Morrison-Maierle has broad experience in ski area planning and design, and has provided a variety of services to several Montana ski areas, including Maverick Mountain, Bridger Bowl, Beef Trail, Snowbowl, Grizzly Peak, King's Hill and Big Sky. This work has included surveys for six ski lifts, complete design of three lifts, design of major improvements to two lifts, and construction inspection of ten lifts, as well as assistance in overall planning.

Engineering to improve the environment.

Adequate water supply and efficient wastewater treatment and disposal are of prime importance to every community and every individual. The environmental engineer maintains or improves the quality of the water we use.

Morrison-Maierle's environmental engineering department is staffed and equipped to serve the needs of municipalities, government agencies and private industry, and has undertaken projects in this field for more than 150 clients. Capabilities of this department include:

Water supply systems— water treatment plants, pump stations, storage reservoirs, well supplies, dams, supply lines and distribution systems.

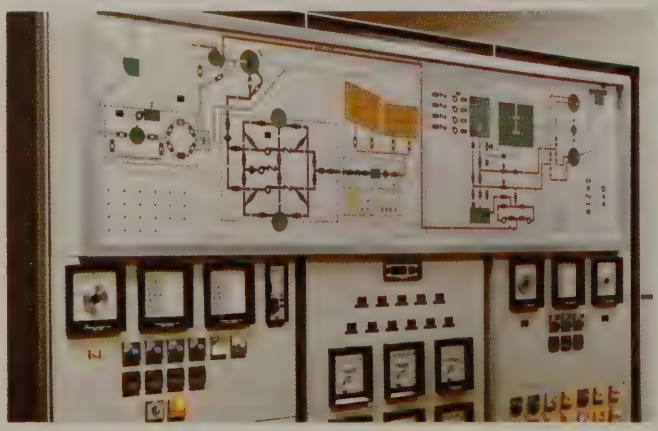
Sanitary sewer systems—wastewater treatment plants, pump stations and collection systems.

Storm drain systems—storm water collection, treatment and disposal facilities.

Services provided for the above projects include preliminary planning, preparation of construction plans and specifications, and construction inspection services.

Graphic Control Panel—Helena Wastewater Treatment Plant.

The graphic control panel gives the plant operator complete plant control and visual indication of all plant flows, equipment operations, valve positions and other plant functions from a single location in the Control Room.

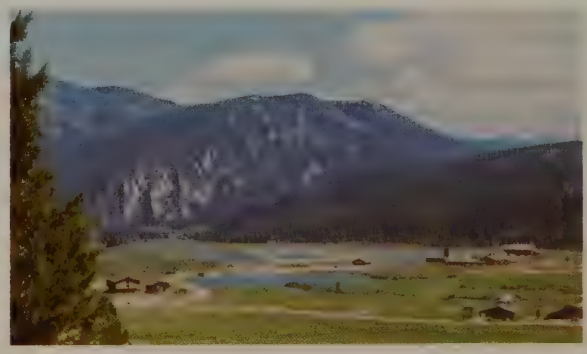


Wastewater Treatment at Glacier National Park.

Morrison-Maierle designed wastewater collection and treatment facilities for the three major visitor areas in Glacier. The project prevents pollution by returning the treated wastes to the land; none reaches park waters.

Preserving the beauty of Big Sky.

Visitors to Big Sky admire these four attractive ponds, never knowing that the two most distant ones are for wastewater treatment. The process has no discharge, providing sanitary water for irrigation and other uses. Design of the facility is aesthetically in accord with Big Sky's architectural theme.



Making the most of our water resources.

Increased interest in wise management of water resources has resulted in substantially expanded activity for Morrison-Maierle's water resources section. Professional services in this field have become vital to production of energy, food, and fiber, as well as for the maintenance of the natural habitats of fish and wildlife, and human recreation needs.

Our water resources staff has diversified planning expertise in such specialized areas as irrigation, water rights, hydropower generation, domestic water supply, flood plain identification, mineral and industrial development, and fish, wildlife and outdoor recreation. The staff includes hydrologists, geologists, water resources planners, agricultural engineers and civil engineers specializing in hydraulics, statistics, computer applications, water quality and optimization.

The scope of study within projects has ranged from reconnaissance level planning, and feasibility studies, to actual design and construction. Within projects requiring selection of alternatives, our capability extends beyond fundamentals to watershed modeling, project simulation and operations research.

Morrison-Maierle has dealt with both small watersheds of local importance and nationally significant river basins, chiefly in the Northwestern and Southwestern U.S. Major studies have been conducted in the Missouri, Colorado, Columbia and Hudson Bay drainages.

Black Lake Dam.

Morrison-Maierle engineers studied the need for a dam to serve the Flathead Indian Reservation. Their solution not only provides the water, but also blends harmoniously with the surrounding area.

Million-gallon reservoir at Columbus.

Morrison-Maierle made feasibility studies for this water storage reservoir, and then designed the welded-steel structure. Holding water for both city and domestic use, the tank was set into the landscape for the least visual impact.

Emergency flood construction.

Part of the Montana Blackfeet Indian Irrigation Project, this pumping plant was designed to supplement river flow after flooding caused failure of the Lower Two Medicine Lake Dam, near Glacier National Park.

Structural design for beauty and function.

Morrison-Maierle's structural engineering department has broad design experience. Projects undertaken range from $1,000 to $10 million in construction costs, from small structures to the longest bridge in Montana.

The department offers complete in-house structural design expertise on all projects. Capabilities extend to complete structural design of industrial, commercial and residential buildings, as well as bridges and specialized structures. Structural inspection and investigation of existing structures is an added service.

Continually updating its design capabilities, Morrison-Maierle incorporates improved design concepts, materials and methods to provide clients with construction cost savings wherever possible. This includes computer analysis, often resulting in the development of advanced structural design concepts with greater flexibility and function.

Prize-winning bridge at Libby.

Design of this steel-span bridge at Libby, Montana presented some interesting structural engineering problems. Unusually tall concrete piers were required, together with long structural steel trusses.

1975 Low-Clearance Winner.

The Morrison-Maierle design for this bridge over the South Fork, Flathead River, won 1st prize among Medium Span, Low Clearance entries in 1975 competition conducted by the American Institute of Steel Construction.

Computer analysis determines structural requirements.

Morrison-Maierle's computer capability was needed to analyze strength and deflection considerations for the St. Labre Church, Ashland, Montana. Designed by Crossman-Whitney-Griffin, architectural associates of the firm, the building is faced with rock common to the area, applied as veneer to a cast concrete flat plate panel.

Modern highways with aesthetic appeal.

A major portion of the nation's economic base depends on our four-million-mile road network. Morrison-Maierle has played a large part in the completion of hundreds of miles of traffic facilities, developing many projects from location study and mapping phases to production of contract plans and specifications, and in some cases providing construction staking and inspection. These projects have ranged from multilane highways to lower-standard, single-lane roads for microwave relay tower and forest access. In recent years, work has been concentrated on the U.S. Interstate System, and on Bureau of Indian Affairs reservation service roads.

Morrison-Maierle furnishes complete road planning services, covering preparation of environmental impact statements, location studies, highway design and plans, traffic studies, location or construction surveys, construction quality assessment, as well as design and plans for right-of-way, utilities, signing and fencing. Electronic distance-measuring equipment and electronic computers are used for project survey and aerial mapping control and for major earthwork quantity determinations.

Scenic and serviceable.

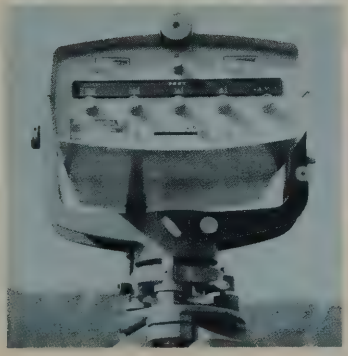
Morrison-Maierle designed this highway for the Bureau of Indian Affairs.

In tune with the environment.

In designing the Wolf Creek Highway between Great Falls and Helena, Montana, Morrison-Maierle engineers were able to preserve the area's natural character.

The Hewlett-Packard 3800 Distance Meter.

Modern distance-measuring equipment assures speed and accuracy of survey work.



Airports engineered for the future.

An airport for today and tomorrow.

Prime consultants for the Helena airport terminal complex, Morrison-Maierle engineers prepared a Master Plan Study that tailors the facility to a variety of community needs projected over a 20-year period. The firm planned the entire airport, including auto access and parking, the terminal, and ramps, taxiways and runways.

Nowhere is broad experience more essential than in the long-range planning and design of airport facilities. Airport projects undertaken by Morrison-Maierle range from the jet capabilities of Malmstrom and Glasgow Air Force Bases and airports serving several metropolitan areas in the Northwest, to simple, graveled strips in wilderness areas.

Morrison-Maierle specializes in preparation of Master Planning Studies that forecast aviation needs on a 20-year basis, and provide guidelines for present and future development. These studies include preliminary air space, land use, noise and financial feasibility studies of the area under consideration, the compiling of plans and recommendations, designing the entire facility and inspecting its construction over the period covered by the plan. This work is done with the help of local economic consultants, and the architectural firm of Crossman-Whitney-Griffin.

Streets and subdivisions: urban planning for better living.

Morrison-Maierle has diversified capabilities in urban planning, research economics and systems analysis to meet both state and local requirements. Services offered include city, state and regional planning, urban renewal, economic feasibility studies, systems planning, urban design, landscape architecture and industrial development.

Concept planning for subdivisions and Planned Unit Developments requires expertise and experience in creative urban design. Making most spacious, interesting and aesthetically satisfying use of land intended for high-density residential communities is the goal. Planning by Morrison-Maierle begins with land-use studies determining the impact of the subdivision on the community, and continues through physical platting of the land to show recommended size and use of tracts, vehicle and pedestrian traffic circulation, and access from the surrounding community.

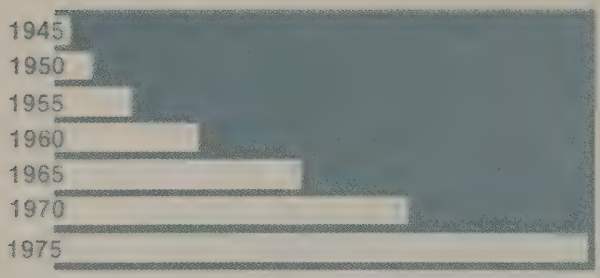
Street improvements amounting to many millions of dollars have been designed and implemented by Morrison-Maierle. Projects are undertaken from inception through feasibility and traffic studies, boundary creation, cost studies, design, and construction staking and inspection. The necessary balance between the interests of individual property owners, city ordinances and sound engineering practices in design and construction is carefully maintained.

A high-density area with breathing space.

In dramatic contrast to the surrounding area, this subdivision has neither square lots nor crisscrossing streets. Instead, Morrison-Maierle engineers designed diversely shaped lots to front on circular courts with access from curved streets. Greenbelts add beauty, interest and a feeling of spaciousness not found in conventional city blocks.

Prospective homeowners tour a Morrison-Maierle designed subdivision. To many buyers, aesthetics of the living area are as important as the house itself.

The people behind Morrison-Maierle, Inc.



Practicing since 1945.

Morrison-Maierle, Inc. grew from a private consulting engineering practice founded by John H. Morrison in 1945. John Morrison's early work in many engineering fields filled a growing need in Montana for qualified engineering organizations to offer services to cities, counties, businesses, government and other agencies, and individuals in the state and surrounding areas.

Joseph A. Maierle joined the business in 1946, and the firm of Morrison-Maierle grew with the state, adding strong and specialized departments and personnel to meet the growing needs of its clients.

Today, the five Morrison-Maierle offices and the associated corporation of Morrison, Maierle & Preator, Inc. in Salt Lake City together employ more than 75 professional and technical personnel, each dedicated to continuing the Morrison-Maierle tradition of excellence.

The Morrison-Maierle board room.

More than 200 years of professional engineering experience are wrapped up in Morrison-Maierle's officers and directors. With the exception of James A. Maierle, corporate secretary and business manager, all of these men are registered professional engineers actively participating in the day-to-day engineering activities of the firm.

Founding officers of Morrison-Maierle, Inc.

John H. Morrison, Treasurer, provides general consultation to officers and others in the firm, and carries out client contact work.

B.S., civil engineering, Montana State University, 1927. Professional degree in civil engineering, Montana State University, 1931. Honorary Doctor of Engineering, Montana State University, 1968, and Montana School of Mines, 1966.

Montana State Registration Board for Professional Engineers, 1957-1969.

Fifty years' experience supervising engineering and administrative work.

Who's Who in Engineering, recipient of the AWWA Fuller Award. ASCE, ACEC, NSPE, MSE.

Joseph A. Maierle, Chairman of the Board, supervises overall administration, accounting and personnel management of the organization.

B.E., Carroll College. C.E., International Correspondence School. Honorary Doctor of Laws, Carroll College, 1967.

Forty-five years' experience in design, planning and supervision of all types of municipal projects including water supply and treatment, sanitary sewer systems, street improvements, airport planning, foundation investigations, road and highway design.

ASCE, NSPE, ACEC, ARBA, MSE.

Other officers and board members.

Albert N. Kraft, Vice-President and Head of Highway Department, Assistant Manager.

B.S., civil engineering, Montana State University, 1950. Joined Morrison-Maierle in 1950.

Experience includes design of bridges, buildings, secondary roads, interstate highways and street improvements. Has been in charge of design and surveys for interstate highway projects since 1960.

ASCE, NSPE, MSE.

Harold L. Eagle, Vice-President and General Manager.

B.S., civil engineering, Montana State University, 1943. M.S., civil engineering, University of California, 1950.

Thirty-two years of engineering experience, 27 with Morrison-Maierle. Headed development of the structural engineering department. Has designed and supervised the design of numerous building, bridge, water and sewer projects. Has also handled projects in economics, rate studies and comprehensive planning.

ASCE, NSPE, MSE, ACI, ACEC.

John H. Morrison Jr., President, heads overall administration of the firm's activities. Assists in directing airport, street and subdivision projects in particular. Took charge of Morrison-Maierle's initial venture in overseas work.

B.S., civil engineering, Montana State University, 1955.

Twenty years' experience in structural, highway, water, sewer and airport design, as well as supervision of airport and street construction.

ASCE, MSE, NSPE, ACEC.

James A. Maierle, Corporate Secretary and Business Office Manager.

B.S., commerce, Montana State University, 1970.

Supervises computerized accounting systems and accounting personnel for the firm and several affiliated firms and branch offices. Handles budgeting, quarterly project-cost evaluations and other reports to provide current operating information.

Also members of the board.

Willis J. Wetstein, Head of Environmental Engineering Department.

B.S., civil engineering, Montana State University, 1957.

Has been a project engineer, and has designed and supervised water and sewage treatment projects since he joined the firm in 1957. Has headed the Environmental Department since 1965.

NSPE, MSE, AWWA, WPCA.

William Keith, Head of Structural Engineering Department.

B.S., architectural engineering, Montana State University, 1953. B.S., civil engineering, Montana State University, 1956.

Twenty years' experience, 19 with Morrison-Maierle. Designed and supervised several large bridge projects in Montana and Utah, as well as numerous other structural projects. Supervised engineering for the firm's work on bridge repair and replacement in South Vietnam. Succeeded John Morrison Jr. as engineer in charge of the firm's South Vietnam district highway office.

ASCE, NSPE, MSE.

Larry Larsen, Manager, Billings branch office.

B.S., civil engineering, South Dakota School of Mines and Technology, 1961.

Experience as a project engineer, and has designed and supervised highway, water, sewer and storm drain projects. Has headed the Billings office since 1970.

ASCE, NSPE, MSE.

Our Associates in Architecture.

Morrison-Maierle is able to provide full architectural services in conjunction with engineering planning. This is accomplished through a separate organization, Crossman-Whitney-Griffin, Architects, a spin-off from Morrison-Maierle, Inc.

The architectural partnership, founded in 1958, has proven capable of undertaking creative architectural design services for very large and complex projects. At present, staff members include 12 architects and architectural draftsmen.

The team approach practiced by the two firms allows Morrison-Maierle to include, as a matter of course, architectural considerations in engineering projects. Conversely, the architectural firm is provided with a close source of assistance with civil and structural engineering related to its projects.

As chief of Morrison-Maierle's structural engineering division, Bill Keith, left, works with Crossman-Whitney-Griffin, Architects on many projects. He is shown here with C-W-G partners Grant Crossman, Dick Griffin and Wayne Whitney.

Design of this Community Center at Lame Deer, Montana, reflects the heritage of the Crow Nation. Crossman-Whitney-Griffin—architects, and Morrison-Maierle—engineers.

Proposed office complex for Montana Highway Department at Helena with architectural design by Crossman-Whitney-Griffin and structural engineering by Morrison-Maierle, Inc.

Clients.

More than 80 cities and towns
19 counties
City-County planning boards
County water and sewer districts
Irrigation districts and companies
Airport boards
School boards
Hospital boards
Oil companies
Utility companies
Telephone companies
Banks and Trust companies
Supermarket chains
Ski and other recreation areas
Insurance companies
Industries
Railroads
Land developers
Indian tribal councils
Universities
Churches
Fraternal organizations
Ranches
Attorneys

State of Montana

Aeronautics Division
National Guard
Architecture & Engineering Bureau
Fish and Game Department
Department of Highways
Liquor Division
Department of Natural Resources & Conservation

United States Government

Bureau of Indian Affairs, Billings, Mont.
Bureau of Indian Affairs, Gallup, New Mex.
Indian Reservations in Montana, Arizona, Colorado, New Mexico, Utah.
Department of the Navy, Seattle, Wash.
U.S. Forest Service, Missoula, Mont.
General Services Administration
Geological Survey
Air Force
Army Corps of Engineers: Walla Walla, Seattle, Sacramento, Huntsville and Omaha Districts
Department of Agriculture
Public Health Service
Agency for International Development, Saigon, South Vietnam

Consultants.

Soils - Foundations - Materials Testing

Foundation and Materials Consultants, Helena
Northern Testing Laboratories, Great Falls
Mueser, Rutledge, Wentworth & Johnston, New York

Electrical - Mechanical

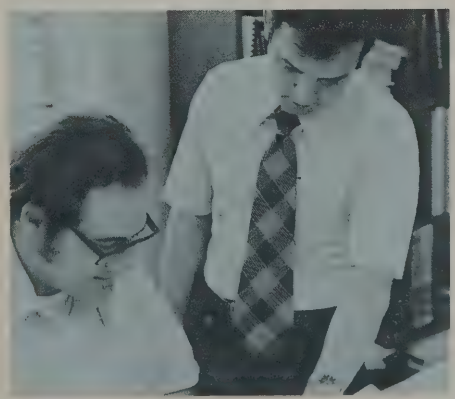
Associated P & C Engineers, Billings
General Engineers, Missoula
J.S. Gordon Engineers, Billings
Stark Bridwell, Billings
Drapes Engineering, Great Falls

Aerial Photogrammetry

Scharf and Associates, Denver
Montana Aerial Photography, Missoula
Horizons, Inc., Rapid City
Kucera and Associates, Denver

Economic Evaluations

TAP, Inc., Bozeman
Battelle - Northwest, Richland, Wash.



Architectural

Crossman-Whitney-Griffin, Architects, Helena
Overturf, Strand & Associates, Architects, Billings

Wildlife & Natural Resources - Landscape Architecture

Wirth Associates, Billings
Ecological Consulting Service, Helena

Freeways

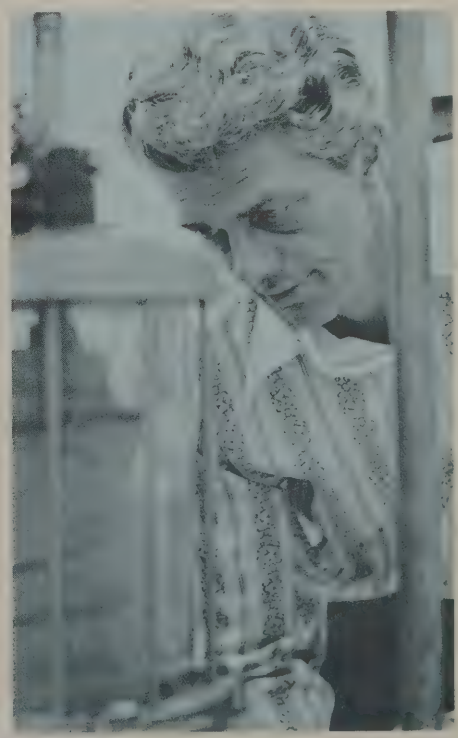
Edwards and Kelcey, Newark

Land Subdivisions

Engineering Service Corporation, Los Angeles
Wilsey & Ham, Seattle

Consultants mean added expertise.

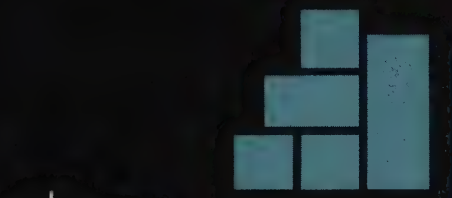
A variety of firms are retained on a consulting basis by Morrison-Maierle. Here, a consulting engineer retained by Morrison-Maierle performs a triaxial compression test on a compacted soil sample.



Code of Ethics.

With highest regard for their fellowmen and their profession, members of the American Consulting Engineers Council acknowledge their responsibilities to society, accept this Code of Ethics as a set of dynamic principles to guide them in their practices as consulting engineers and shall ...

- Hold paramount the safety, health and welfare of the public in the performance of their professional duties.
- Perform services only in the areas of their competence.
- Issue public statements only in an objective and truthful manner.
- Act in professional matters for each client as faithful agents or trustees, and shall avoid conflicts of interest.
- Build their professional reputations on the merit of their services and shall not compete unfairly with others.
- Associate only with reputable persons or organizations.
- Continue their professional development throughout their careers and shall provide opportunities for the professional development of those engineers under their supervision.



Morrison-Maierle, Inc.

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Ph. 406-442-3050

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Billings, Montana 59102
Ph. 406-259-5546

311 Haggerty Lane
Bozeman, Montana 59715
Ph. 406-587-0721

122—1st Avenue West
Kalispell, Montana 59901
Ph. 406-755-2281

101 South Locke, Room 201
Farmington, New Mexico 87401
Ph. 505-325-8811

ASSOCIATED FIRM:
Morrison-Maierle & Preator, Inc.
2017 East 33rd South
Salt Lake City, Utah 84109
Ph. 801-484-5591

In the field.

Two Morrison-Maierle engineers observe construction of the Koocanusa Lake Bridge, Libby, Montana. Although responsible only for its design, but not for construction supervision, M-M engineers did follow its progress closely.

CONSULTING ENGINEERS COUNCIL

JMM

INTRODUCTION

This brochure will introduce the firm of James M. Montgomery, Consulting Engineers, Inc. (JMM). We are a firm with over 30 years of experience specializing in planning, environmental studies and civil and sanitary engineering. In the past three decades we have served over 500 separate clients, including individuals, large and small cities, special districts, counties, planning agencies, state and federal agencies, companies, industries, developers, and other engineering and architectural firms.

Our office for the Northwest and Intermountain States is located in Boise, Idaho. Other offices are located in California, Nevada, Florida and Washington, D.C. Our staff consists of experienced civil, sanitary/environmental, mechanical, structural, electrical, architectural, geological and chemical engineers. For environmentally-related studies, we have experienced personnel in the appropriate fields of environmental science.

Many of our staff are recognized regionally and nationally for their expertise and contributions in advancing their respective fields. Over one-half of our professional staff have advanced degrees, while over one-third of all employees hold professional registration. The firm encourages active participation within the professional societies and organizations, and many of the staff serve on numerous local, regional and national committees.

The capabilities and projects described in the following pages provide a cross-section of our background in various fields. We hope that it will give you a true feeling for our experience and capabilities.

PROFESSIONAL SERVICES

Studies

Planning

Design

Management

Construction Inspection

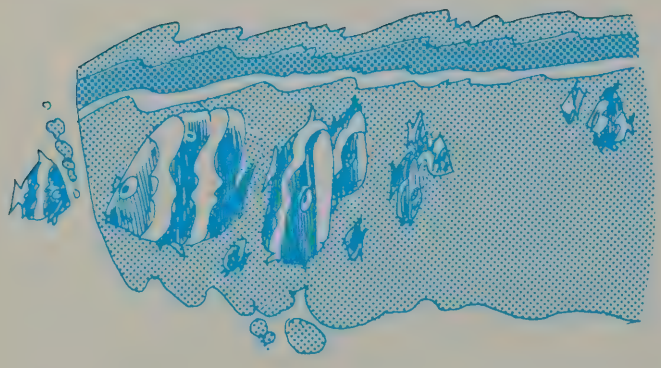
Operations

FIELDS OF ACTIVITY

Appraisals
Basin Management Programs
Community and Areawide Planning
Computer Applications
Construction Management
Demineralization
Drainage and Flood Control
Environmental Assessments and Impact Studies
Feasibility Studies
Financial Analyses
Governmental Financial Programs
Hydrogeological Investigations
Industrial Waste Treatment
Irrigation Systems
Master Plans
Municipal Engineering
Ocean Outfalls
Operation and Maintenance Programs
Personnel Training Programs
Pipelines
Project Management
Rate Studies
Reservoirs
Sewers
Solid Wastes
Storm Drains
Telemetering Systems
Water Quality Testing and Analyses
Wastewater Treatment and Reclamation
Water Resources Development
Water Treatment
Water Wells

ENVIRONMENTAL and WATER QUALITY STUDIES

The increasing awareness of the variety and complexity of existing and potential environmental problems and the public awareness of these conditions are playing a major role in planning and engineering decisions. JMM has prepared a substantial number of environmental assessments, studies and evaluations for private and governmental agencies. Among these are an Environmental Overview Report for the State of Idaho to inventory the existing environmental conditions throughout the state and to identify key areas of ecological concern. This report will be used to help guide Idaho decision-making entities for planning, management and administration purposes. For the Environmental Protection Agency (EPA) Region X, Seattle, JMM was selected to research logging residue management and reforestation criteria for the protection of water quality. The results of these studies and others conducted by the EPA will be used to establish logging guidelines to protect water quality in Idaho, Oregon, Washington and Alaska.



Numerous environmental impact reports have been prepared for private, local and state projects, ranging from dams and river diversions to comprehensive master plans and regional wastewater facilities. In preparing environmental reports we have provided total project management and coordination, including obtaining expert testimony representation and presentation at public hearings and establishing mitigation and regulatory operational criteria. Our experience in this field is exemplified by the selection of JMM to prepare an Environmental Impact Statement (EIS) for the Salmon Creek Interceptor project in Juneau, Alaska.

The firm is experienced in establishing environmental monitoring and data collection programs, and providing the subsequent analysis, interpretation, and review of the data compiled. Programs of this nature are necessary in self-monitoring discharges, providing environmental baseline data on proposed projects, and maintaining close control on environmental conditions resulting from the implementation of these projects.

We have conducted research in almost all phases of municipal and industrial discharge, including thermal pollution, viral physiology and toxicity, process control, nutrient loading and eutrophication.

ENVIRONMENTAL SPECIALITIES

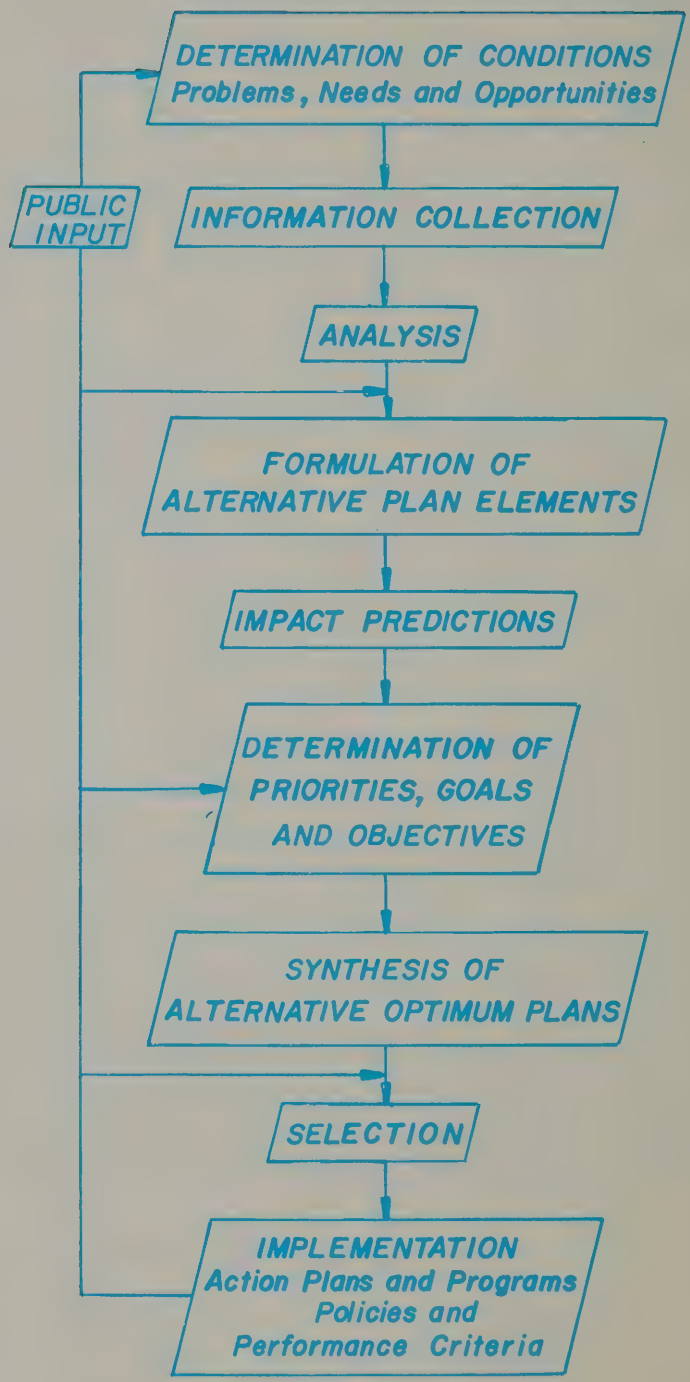
Air Quality
Biological Sciences
Chemistry
Environmental Health
Environmental Planning
Environmental Sciences
Forestry and Range Management
Geohydrology
Geology
Hydrology
Land Use
Noise
Physical Sciences
Sanitary Engineering
Water Quality

COMMUNITY and AREAWIDE PLANNING

JMM offers comprehensive planning services on either a community or an areawide basis. The firm recently formulated a plan for the Ada Council of Governments which involved land use on steep slopes and sensitive soils, land uses adjacent to streams, stream channel alterations, urban runoff, development criteria, and the phasing of future growth with facilities service expansion. Recently, a comprehensive Environmental Overview Report was completed for the State of Idaho which included an inventory of flood hazard areas, critical soil and slope areas, geothermal areas, deteriorated forest conditions, second home subdivisions and solid waste disposal sites.

JMM personnel are experienced in all aspects of community and areawide planning, with emphasis on natural land areas and environmental management. Additional depth is added to our comprehensive planning experience with our background in public works facilities and environmental assessment capabilities.

Comprehensive planning on a community or areawide basis can include elements concerning business and industry, community design, community growth, conservation and preservation, housing, institutional analysis, land use, public services and utilities, recreation and open space, and transportation.



BASIC PLANNING METHODLOGY

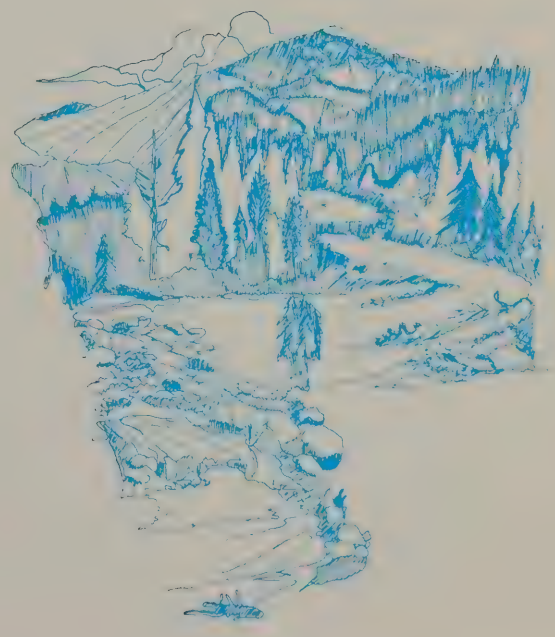
WATER RESOURCES PLANNING and DEVELOPMENT

JMM is nationally recognized as a leader in the field of water resources planning and development. Organizational ability on both the domestic and international level has resulted in a reputation for excellence within the profession. Our in-house staff has broad experience in evaluating and solving problems in all aspects of water resources, from source location through basin management and reclamation to terminal discharge. Water resource projects have ranged in scope from locating and developing small domestic water wells to completion of areawide water supply and irrigation systems. At Helena, Montana, JMM was selected to perform an economic and feasibility study for developing a water supply system to serve the Veterans Administration Center and National Guard facilities.

Staff members have had extensive experience in the field of hydrogeological studies and groundwater basin management. Coordination of imported sources of supply with local surface and groundwater supply has always been a major factor in our studies. We have participated in operational economic studies on a number of large groundwater basins in cooperation with public agencies. Mathematical models (digital) of these groundwater basins have been developed for these agencies. These models have been verified by geologic and hydrologic analysis, and alternative operational plans are presently being studied.

Numerous surface and subsurface studies for both local and regional water resource development programs have been conducted. Utilizing geologic, hydrologic and geophysical data, the aquifer potential is evaluated and favorable drilling sites are selected. Supervision has been provided for all types of well drilling, development and testing operations. Future water requirements have been determined by making detailed studies of projected land uses and water needs. Combining legal and institutional policies with water resource potential, basin operations have been developed which are consistent with sound groundwater basin management. The firm has also participated in a number of water rights litigation cases, in which it has been necessary to recognize the proper basin data and then, through the use of these data, correlate surface hydrology, groundwater hydraulics, and water quality.

The firm conducted a planning study for the Nevada Division of Water Resources evaluating future water requirements and available water resources in southern Nevada and provided a potential water development schedule and alternatives and methods of developing the existing sources of supply.



WATER SYSTEMS

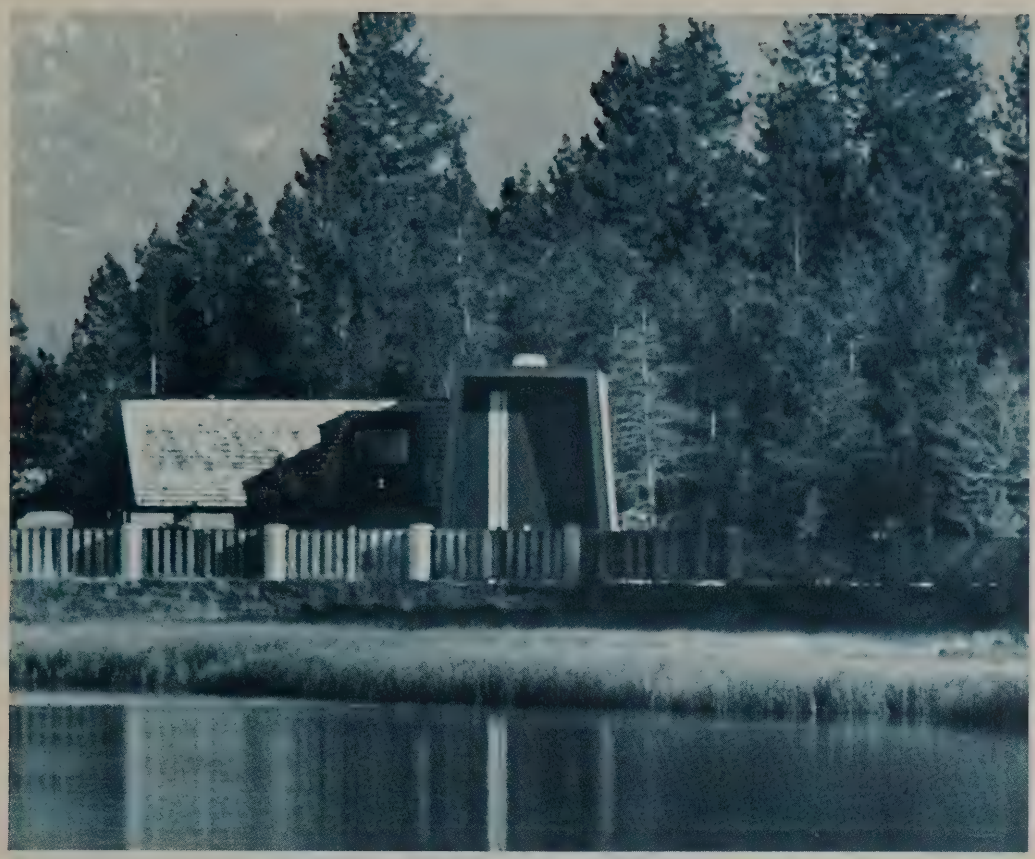
JMM has prepared over 175 master plans and feasibility and economic studies for water and wastewater projects. Many of the water system studies have included detailed investigations of alternative sources of supply, management, financial, economic and technical analysis, as well as preparation of preliminary plans and cost estimates. In addition, we have prepared over 160 other engineering studies, investigations and reports on related subjects such as groundwater development, special water treatment problems, reservoirs, treatment plants, distribution systems, corrosion prevention, water rates and appraisals.

We have designed numerous small and large pipeline systems. These designs include more than 2,500 miles of pipelines in diameters up to 144 inches. For analysis of complex distribution systems we utilize our own network program and in-house computer facility. Our staff has specialized knowledge and experience in corrosion control, and actively participates in corrosion research and seminars.

Over 150 reservoirs have been designed by the firm, ranging from a 20,000-gallon steel tank to a billion-gallon asphaltic lined reservoir with a compacted earth embankment. Reservoir designs have included reinforced concrete, prestressed concrete, precast concrete arch-panel, and steel construction for buried, partially-buried, ground-level and elevated structures. JMM was awarded an Engineering Excellence award in 1972 by the Consulting Engineers Council of the United States for the design of the 19.3 mg Greystone Reservoir for the City of Beverly Hills, California.

Over 130 water and wastewater pumping stations have been designed, ranging in capacity from less than 100 gpm to 250,000 gpm, with total connected horsepower of up to 18,000 hp.

These stations have included all types of pumps, both electric and natural gas drive units, electrical controls for both local and remote operations, and telemetering. Our experience includes the world's largest natural gas engine-driven water pumping station, located in Las Vegas, Nevada.



WATER TREATMENT

JMM has a long history in the development of water treatment processes and techniques, and is recognized nationally as a leader in the field. The staff has prepared studies and designs for nearly 50 water treatment plants, ranging in capacity from less than 0.1 mgd to 800 mgd. Our clients have included a broad range of public agencies and private companies, such as the U.S. Atomic Energy Commission in Idaho Falls, the City of San Francisco, the International Paper Company, Disney World, the Metropolitan Water District of Southern California and the Central Utah Water Conservancy District. Treatment plant designs have included a wide range of sizes and types of facilities for gravity and pressure filtration, iron and manganese removal, water softening and demineralization to reliably supply safe drinking water and industrial process water.

Our firm is associated with many recent advances in the field of water treatment. Innovations which have been incorporated in facilities that we have designed include pumping blenders (flash mixing), tapered hydraulic flocculation, designed compartmentalization, vacuum sludge removal, backwash conditioning, simplified filter controls, high rate filtration (10 gpm/ft ^{2}), and air lift backwashing. These innovations have provided considerable reduction in construction and operating costs.

WASTEWATER PLANNING

JMM's experience in wastewater planning ranges from preparing Basin Plans and Areawide Wastewater Management Plans to completing nearly 50 facility plans and related studies for wastewater collection, treatment and disposal/reclamation projects. These planning efforts include facilities ranging in size from less than 0.1 mgd to regional plants in excess of 90 mgd. They have included evaluating alternative solutions, facility locations, priorities, construction scheduling, estimating costs, financing, institutional arrangements and environmental impacts. Many of the projects have involved wastewater reclamation of effluent for industrial, agricultural and recreational reuse. JMM is very capable and experienced in evaluating existing collection systems, pumping facilities and treatment plants for expansion and/or increased performance. Because of our experience and expertise in planning, evaluation, design, cost estimating, financing and operation of all types of wastewater collection and treatment facilities, we can provide wastewater planning that properly considers all the necessary technical, financila, institutional and environmental factors. This is done not only to satisfy the regulatory standards of today, but also to have the flexibility to meet future standards.

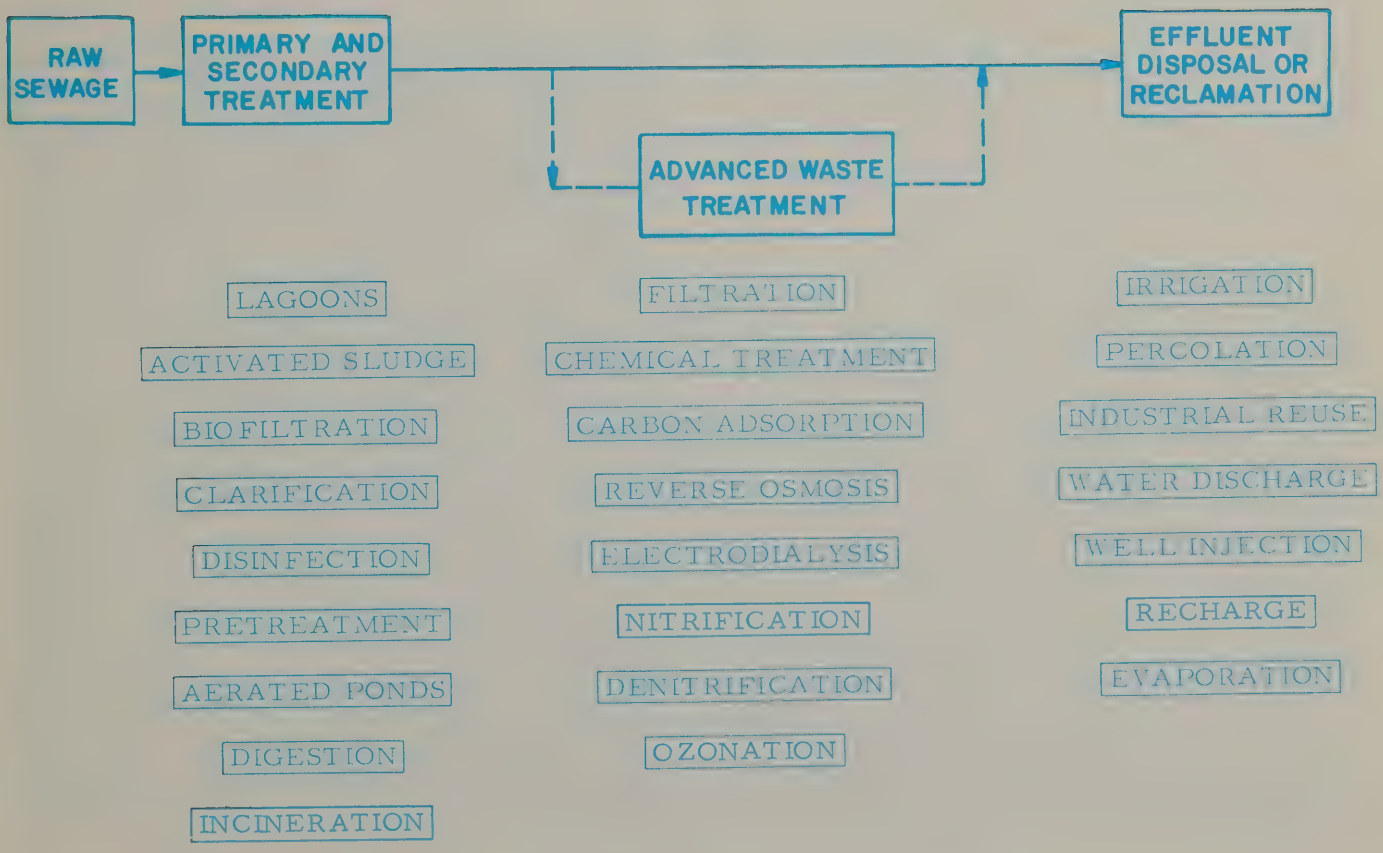
WASTEWATER COLLECTION SYSTEMS

We have designed several hundred miles of major sanitary sewers in diameters of up to 144 inches. These have included complete collection systems, pumping stations, force mains and interceptor lines for several communities, both small and large. These projects have involved utilizing various types of piping materials and above- and below-ground pumping stations.

WASTEWATER TREATMENT and DISPOSAL/RECLAMATION

We have designed over 60 wastewater and industrial waste treatment plants ranging in capacity from less than 0.1 mgd to 90 mgd. These treatment facilities have included many different types of primary, secondary and advanced waste treatment. In a number of projects, wastewater is reclaimed for industrial, agricultural or recreational reuse.

JMM is uniquely qualified in evaluating existing treatment facilities for increased performance and/or expansion through its experienced staff of sanitary engineers and treatment plant operators. This is best indicated by the selection of JMM by the EPA to perform their post-construction evaluation of treatment facilities in Nevada and California. Evaluations and operational studies have been performed on secondary and advanced waste treatment facilities in Idaho, Oregon and Washington.



INDUSTRIAL WASTE MANAGEMENT

FOOD PROCESSING

MANUFACTURING

METAL PLATING

PETROLEUM

BEVERAGE

PULP AND PAPER

UTILITIES

CHEMICAL

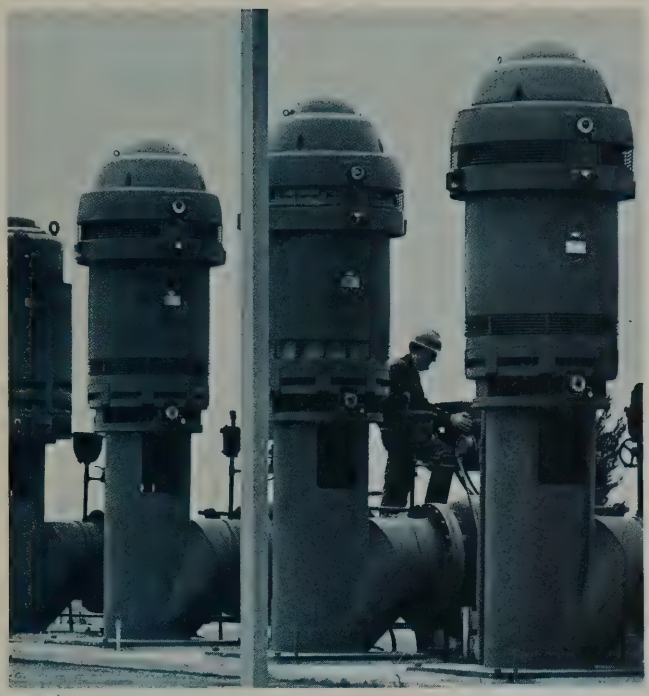
MINING

AGRICULTURAL

Our services to industrial clients range from assisting on EPA or state permits to feasibility studies, design and construction management. Typical projects have included in-plant surveys to identify and quantify waste sources within unit processes; source control programs for by-product recovery; process changes and operational control; water supply and conditioning systems to minimize waste streams; waste treatment and pretreatment for discharge to municipal systems; effluent management for direct discharge or reclamation and reuse; and solids processing and solid waste disposal. Typical industrial clients include the Aluminum Company of America, International Paper, Kaiser Steel Company, The Nestle Company, Owens-Illinois, Pacific Foods, Pepsi-Cola Bottling Company, Disney World, Reserve Mining Company, Shell Oil Company, Southern California Edison Company, Stauffer Chemical Company, Sunkist Growers Inc., Union Pacific Railroad Company, Western Idaho Potato Processing Co., and the Weyerhaeuser Company.

NONPOINT SOURCES OF POLLUTION

Experience includes projects relating to silviculture, agriculture and cattle operations, mining operations, hydrologic modifications, urban and suburban development, construction activities, surface and subsurface disposal of liquid and solid wastes, and spills of hazardous wastes. JMM was selected by the Idaho Department of Health and Welfare to prepare a survey and assessment of all local, state and federal nonpoint source programs in the state.

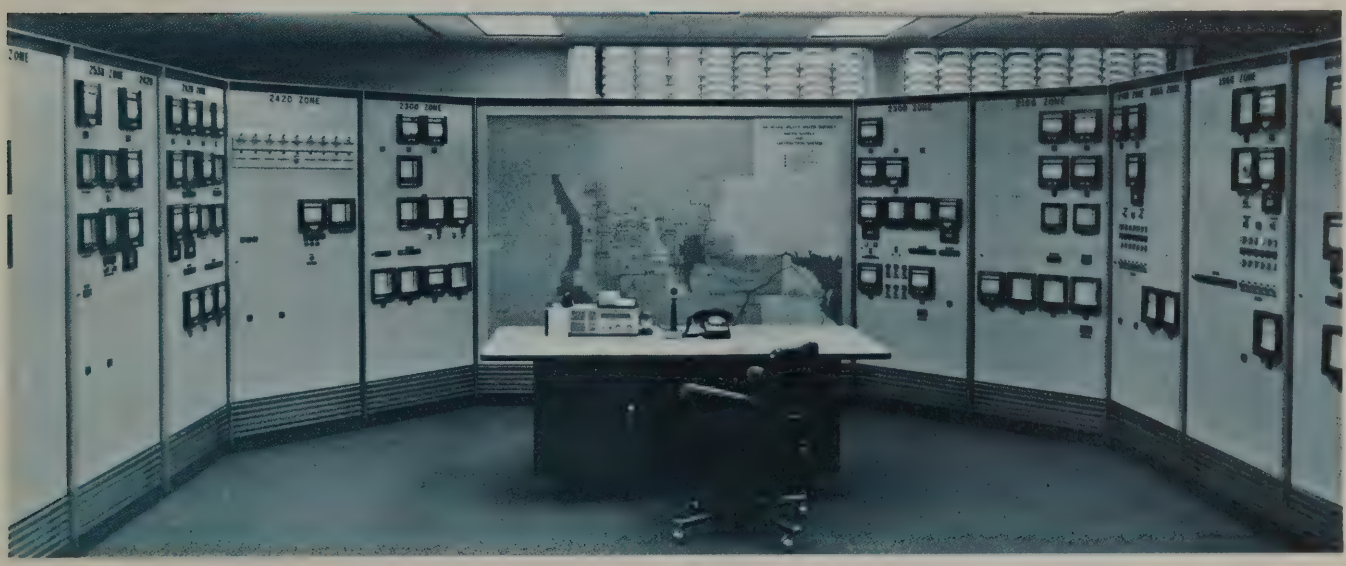


IRRIGATION SYSTEMS

JMM has nearly 30 years of experience in the planning and design of water and irrigation systems. Many of our civil, hydraulic, mechanical, environmental and geological engineers specialize in water rights, groundwater studies, well development, pumping facilities, pipelines and telemetering control systems. In addition, we are experienced in material and equipment selection, corrosion control, startup and operation, water quality studies, and water pollution problems from irrigation return flows and nonpoint sources of pollution.

AUTOMATIC CONTROL and TELEMETERING

JMM has extensive experience in all fields of automatic control and data logging. Our designs include radio and telephone-wire tranmission systems, and remote unattended operation systems. These systems include all phases of water and wastewater system operation from starting and stopping a single pump to the unattended operation of complete water and wastewater treatment plants.



SOLID and HAZARDOUS WASTES

JMM has a broad base of experience in providing engineering studies and design services for municipal and industrial clients in solving their solid and hazardous waste problems. At the Disney World Complex in Florida, a comprehensive study on the makeup and sources of solid wastes was made. The study resulted in our recommendation of a vacuum collection system and the design of an incinerator for disposal of 100 tons per day of solid wastes. For the City of Long Beach, California, JMM conducted a study on the possible pollution of groundwater from a proposed municipal-industrial rubbish site. Other projects have dealt with toxic and dangerous chemical disposal, and municipal and industrial sludge disposal.

APPRAISALS and WATER RATE STUDIES

Over 40 appraisal reports involving primarily the value of water-utility properties have been prepared. Appraisals of various types of utilities have been prepared, ranging from single water wells to large irrigation and domestic municipal systems. Appraisal techniques used include reproduction cost new less depreciation, original cost, substitutional methods, present-worth concepts, comparable sales, and capitalization.

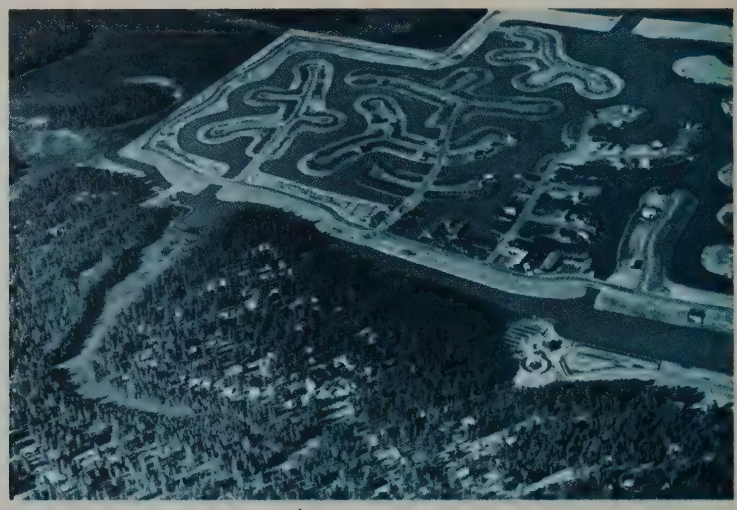
Over 50 analytical and statistical studies relating to water rates and cost of water have been completed. These studies have been prepared in support of recommended water rates as well as in opposition to suggested rate changes. Many of the water rate studies are prepared as an integral part of a complete financial analysis which considers bond issue financing, taxation on real property, reserve funding, disposal of excess utility property, other income sources, and ability to pay.

STORM DRAINAGE and FLOOD CONTROL

JMM has conducted over 25 major flood control and storm drainage master plans and design studies, with estimated individual construction costs ranging up to $25 million. These studies have been broad in scope, involving field surveys, laboratory investigations, drainage mapping, hydraulic characterization, cost estimates, utility relocating, and negotiations between utility companies and flood control districts. Representative projects include a 20,000-acre watershed, management and drainage plan for the City of Santa Barbara, California, and a hydrology study and preliminary design for the 500-square mile area surrounding the U.S. Navy Facility at Point Mugu, California. Other projects have included country-wide long range hydrology programs, storm drainage master plans, dam and reservoir inundation studies, and various design projects for open channels, debris basins, and pipelines of up to 108 inches in diameter. JMM has conducted a number of flood plain studies for site selection of facilities and to meet federal and state safety and insurance requirements.

MUNICIPAL and CIVIL ENGINEERING

As individual projects or as part of other work, JMM has considerable experience on a wide variety of civil, structural, electrical and architectural projects. Specific projects have included site development, parking facilities, street improvements, curbs and gutters, bridges, commercial and municipal buildings, electrical distribution systems and electrical substations.



COMMUNITY and RECREATIONAL DEVELOPMENT

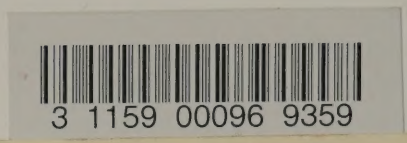
JMM has been providing consulting services for community, industrial and recreational developers for over 20 years. We have been responsible for many of our clients' overall planning and community and governmental relations. Specialized services include:

- feasibility and economic studies
- public presentations and hearings
- environmental studies
- technical assistance in minimizing environmental impact
- master plans for facility development
- water resources development and water rights
- federal, state and local regulatory standards
- evaluation of existing utility systems
- planning and design of water, sewer, storm drainage, streets, electrical and other utility systems
- water quality management studies

Clients that have utilized our services range from individuals and small development firms to large corporations and development companies. Included have been Recreactions, Inc., developers of Elkhorn at Sun Valley; Dillingham Land Corporation, developers of Lake Tahoe Keys; Kaiser-Aetna, developers of Rancho California; and Walt E. Disney Enterprises, developers of Disney World. Others have included Boise Cascade, Sea World, Development Corporation of America, Home Savings and Loan Association, and many others.

REPRESENTATIVE LIST OF CLIENTS

Ada Council of Governments
Aerojet General
C & H Sugar
Carnation Co.
Carson City, City of
Central Utah Water Conservancy District
Clark County
Corps of Engineers
Colorado River Commission
Dillingham Land Corp.
Helix Irrigation District
Home Savings and Loan Co.
Idaho Dept. of Fish and Game
Idaho Dept. of Health and Welfare
Idaho Dept. of Water Resources
Idaho Div. of Budget, Policy Planning and Coordination
International Paper Co.
Juneau Hydroelectric Co.
Kaiser Steel Co.
Ketchum, City of
Las Vegas, City of
Los Angeles Flood Control District
McCarran Airport (Nevada)
Nestle Co.
Northwest Petrochemical Corp.
Nevada Div. of Water Resources
Norton Air Force Base
Pacific Foods
Pepsi-Cola Bottling Co.
Pennzoil Co.
Recreactions, Inc.
Reserve Mining Co.
Ringling Bros.-Barnum & Bailey Circus
Sacramento, City of
Salt Lake Chamber of Commerce
San Francisco, City of
Sea World
Southern California Edison
Southwest Gas Corp.
Shell Oil Co.
Spokane, City of
Stauffer Chemical Co.
Stockton East Water District
Sun Valley Water and Sewer District
Texaco Oil Co., Inc.
Transcentury Properties, Inc.
Tucson, City of
U.S. Atomic Energy Commission
U.S. Environmental Protection Agency
U.S. Navy
Union Pacific Railway Co.
Veterans Administration
Western Idaho Potato Processing Co.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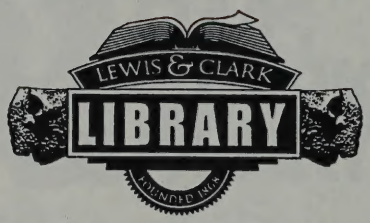

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